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ORIGINAL MEMOIRS.

THE OPERATIVE TREATMENT OF TUMORS OF THE BLADDER.

A PROPOSAL TO SUBSTITUTE BILATERAL LUMBAR NEPHROSTOMY AND THE ESTABLISHMENT OF RENAL FISTULAE IN CASES OF BLADDER TUMOR, FOR URETERAL IMPLANTATION IN CONNECTION WITH BLADDER RESECTION OR TOTAL EXTIRPATION, AND THAT THE BLADDER OPERATION BE DONE AFTER AN INTERVAL AND NOT TOGETHER WITH THE NEPHROSTOMIES.

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MY object in this communication is to trace the steps by which I have been led to submit the proposal embodied in the above title.

The unsatisfactory results of surgical interventions in cases of bladder tumor caused me to seek for some means by which they might be improved, and eventually led to the belief that the manner of dealing with them in some cases in the way that will be described in the course of the paper promises to be one that is well worth a trial at any rate.

The first part of the paper will be devoted to a consideration of what has been accomplished hitherto by the operative treatment of these conditions. The latter part of it deals with the new plan of treatment which I have to suggest. The

sources from which the data have been derived are given in the bibliographical list at the end of the article, and in the tables to be found in the course of the text.

The data with regard to the results of the operative treatment of bladder tumors consist of reports of 653 cases. These include those which are in the classic and authoritative work of Albarran, published in 1892, and such others as I have taken from the literature and personal experience in the course of the succeeding 13 years.*

RESULTS OF OPERATIVE TREATMENT.

Of this series of 653 cases, 243 were benign and 410 were malignant tumors. The special varieties of neoplasms in each class were as follows:

Benign.—Papilloma, 203; myoma, 20; myxoma, 16; adenoma, 2; angioma, 2—243.

Malignant.—Carcinoma, 358; sarcoma, 52—410. Total, 653.

These cases have been studied with reference to

1. The mortality attending each special operative method in each special variety of tumor.

2. The frequency of recurrence and freedom from recurrence respectively that are seen in connection with the performance of each special operative method and in each variety of tumor.

Operative Mortality.—The general operative mortality in cases of benign tumors exclusive of myxoma is 12 per cent.; including myxoma, 17 per cent.

* Since this paper was read by me, at the meeting of the American Association of Genito-Urinary Surgeons, in Montreal, June 13, 1905, the report "On the Indications and Results of Surgical Treatment of Bladder Tumors," by Dr. Rafin, of Lyons, has been presented at the meeting of "l'Association Française d'Urologie," October 5, 1905. The ground covered by Rafin in this most instructive and admirable report includes practically the same data as those presented in this article, so far as they apply to the results of operative treatment of bladder tumors and the conclusions with respect to its result vary but little from those which are set forth in the present communication.

The operative mortality of carcinoma is 27 per cent.; that of sarcoma, 63 per cent.

Mortality with Reference to the Nature of the Operation and to that of the Tumor.—Urethral Operations.—Papillomata, 55 cases, 5 deaths, 9 per cent. mortality.

Malignant Tumors. Carcinoma, 20 cases, 4 deaths, 20 per cent. mortality.

Suprapubic Operations not Resections.—Papillomata, 131 cases, 21 deaths, 11.3 per cent. mortality; myomata, 13 cases, 2 deaths, 15.3 per cent. mortality.

Malignant Tumors. Carcinoma, 222 cases, 62 deaths, 28 per cent. mortality; sarcôma, 35 cases, 22 deaths, 63 per cent. mortality.

Partial Resections of the Bladder.—Papilloma, 17 cases, 1 death; myoma, 4 cases, 1 death. Total, 21 cases and 2 deaths; 9.5 per cent. mortality.

Malignant Tumors. Carcinoma, 91 cases, 17 deaths, 18.6 per cent. mortality.

Total Extirpation of the Bladder. Carcinoma, 25 cases, 14 deaths, 56 per cent. mortality.

One interesting detail which appears in connection with the mortality of the different operations is, that in the cases in which partial resections of the bladder were done for the removal of carcinoma, of which there were 91, the death-rate was but 18.6 per cent.; while in 222 cases, in which tumors of the same nature were removed by suprapubic operations *without* resection, the mortality was 28 per cent.

The mortality of the cases of myxoma and of sarcoma is, it will be noted, very high. Of the two cases of adenoma, one ended fatally, and the same was true of the two cases of angioma.

The lowest mortality shown in connection with any of the operations is that of the benign tumors removed by partial resection and that of the same class of tumor operated upon through the dilated female urethra or through the male perineal urethra.

Recurrence.—Rapid recurrence, from three weeks to eight

months after operations, followed in all but two of the cases of sarcoma and myxoma. In one of each of these classes of cases respectively, the patient survived more than one year.

Benign Tumors.—Papilloma and myoma. Rapid recurrence in 40 cases, or 20.5 per cent. of 195 survivors.

Carcinoma.—Rapid recurrence in 70 cases, or 26.8 per cent. of 261 survivors.

Operative Failures. (Deaths plus rapid recurrences.) Benign tumors, 72, or 29.6 per cent. of 243 patients. Carcinoma, 167, or 46.6 per cent. of 358 patients.

Freedom from Recurrence.—Papilloma and myoma, 64, or 34 per cent., were free from recurrence at the end of one year, and nearly 10 per cent. were free at the end of three years or more after operation. Carcinoma, free from recurrence at the end of one year, 28 per cent.; free from recurrence at the end of three years, 10 per cent.

A feature of much importance in connection with the question of recurrence or freedom from recurrence is the relative measure of the latter attained by the different methods of operating and in the special varieties of tumors. So far as could be determined from the writer's collected series of cases, this appeared to be as follows:

Papillomata.—Urethral operations, 55 cases; surviving,* 50; recurrence, 5 are reported; freedom from recurrence, less than 1 year, 4, more than 1 year, 14, or 28.2 per cent.

Suprapubic operations not resections, 131 cases; surviving, 110; freedom from recurrence less than 1 year, 10, more than 1 year, 40, or 27.5 per cent.

Partial resections, 17 cases; surviving, 16; recurrence, 4 are reported; freedom from recurrence, more than 1 year, 6, or 37.5 per cent.

Myomata.—Suprapubic operations not resections, 16 cases; surviving, 13; recurrence, 5 are reported; freedom from recurrence, less than 1 year, 3, more than 1 year, 3, or 23 per cent.

* Meaning surviving operation.

Resections, 4; surviving, 3; recurrence, 2 are reported; freedom from recurrence, 6 years, 1 case.

Carcinomata.—Suprapubic operations not resections, 227 cases; surviving, 160; recurrence, 36 are reported; freedom from recurrence, more than 1 year, 51, or 31.8 per cent.

Resection, 91 cases; surviving, 74; recurrence, 30 are reported; freedom from recurrence, more than 1 year, 15, 21 per cent.

Total extirpation, 25 cases; surviving, 11; freedom from recurrence, 8 years 1, 1 year to 15 months 4, 3 years 1, 3½ months 2, over 1 year 6, or 54.5 per cent.

The sum and substance of the result of the operative treatment up to the present time may be stated thus: If the operative deaths and rapid recurrences are combined under the one heading of operative failures, such failures are seen to have occurred in 28.6 per cent. of benign tumors, exclusive of myxoma, and in 46.0 per cent. of the cases of carcinoma.

In view of these facts, is it desirable to operate upon these cases radically or not? And if so, when, and upon which ones?

The factors which seem to me to enter into the decision may be placed in a credit and a debit column, for and against operation. Thus:

In Favor of Operation.

1. The condition, if not removed, is necessarily a fatal one, and is one that is beyond the reach of palliative treatment.

2. It is also a suffering condition in the later stages, and in a number of cases palliative treatment cannot relieve the suffering.

3. There are a few patients who have been apparently wholly cured, and a good many more for whom radical operations have secured long intervals of freedom from suffering and symptoms.

4. Because hydro- and pyonephrosis are frequently associated with the bladder tumor owing to the large number of cases in which the latter involves the orifices of the ureters, and because of the possibility of avoiding the above-named renal conditions, were operation done early enough.

5. And, lastly, because of the change from benign to malignant character of the tumors, which is believed to take place in a number of cases.

Against operation.

1. The large proportion of operative failures and the high mortality.

2. The fact that in many cases of benign tumors and in some of the maligant ones as well, there is a long interval between the appearance of the first symptoms and the time at which the patient's suffering is enough to cause them to seek medical advice. The length of this period may be judged from the following figures which are taken from Albarran:

In 56 cases of benign papilloma there were 19 in which this interval was between 3 and 8 years, 4 between 10 and 14 years, and one 30 years. In the remaining 32 cases the average length of time was two years.

In 76 cases of carcinoma the interval was from 3 to 12 years in 12, from 12 to 16 years in 4, but in the remaining 59, the time was less than 1 year.

3. The futility of operating in cases of carcinoma in which metastases are already present and the difficulty of determining whether they exist or not.

4. The hopelessness of operating in cases of sarcoma and myxoma.

Personally, the factors which favor operation outweigh those which are opposed to it in appropriate cases, by which is meant all benign growths and cases of carcinoma in which there is a fair probability that the malignant process has not as yet exceeded the limits of the bladder itself. We may now pass to the consideration of the part of the subject with which this communication is chiefly concerned.

The plan which I have to submit is not, as we have seen, a new surgical device or the introduction of a new method of technique, but consists in the application of a long established surgical procedure, for a purpose, however, for which it has thus far not been utilized. In view of the latter fact, this proposal can only be put forward as a suggestion; and the writer

desires to have it clearly understood that such is his intention in urging the adoption of a plan of treatment that is so radically different from that at present in vogue, and that he invites the fullest criticism of it.

The causes of the high mortality and of the frequent recurrence that have been shown in the first part of the paper to exist, seem to me to be in large measure due to the failure to operate soon enough and radically enough in cases of benign as well as in those of malignant tumors, and to the defects inherent in ureteral implantation.

The very large percentage of recurrence seems to point logically to the necessity of more radical measures in benign as well as in cases of malignant tumors, if we are to hope for better results. The suggestion that I have to make in this respect is, that total extirpation of the bladder, and of the prostate if it be involved in the pathological process be done at the outset in all cases of carcinoma that have not extended beyond the limits of the above named structures, and in which it is believed that there are no metastases, and that the same measure shall be applied in all cases of benign growths in which recurrence has taken place after a primary operation for their removal.

Ureteral implantation, which contributes, as it seems to me, to the surgical failures, should, I believe, be abandoned, and lumbar nephrostomy, with ligation of the ureters, done instead and at some time previous to the operation for the removal of the tumor, as it seems to offer a much safer and less objectionable way of disposing of the most difficult part of the latter operation.

Preliminary nephrostomy would seem to promise to replace the defects and dangers attaching to ureteral implantation with corresponding advantages, thus:

1. The time of the operation upon the bladder would be much shortened instead of being prolonged.
2. Liability to renal infection will be much less.
3. Nephrostomy supplies immediate and sufficient drain-

age of the kidney, instead of the imperfect one afforded by ureteral implantation, and is the best means at our disposal for giving prompt relief to renal retention, whatever be its character; and, as we know, renal retention is frequent in connection with bladder tumors owing to compression of the orifices of the ureters because of the large number of the neoplasms which have their seat in the lower third of the organ.

In some cases the nephrostomy could be utilized for relief that might be expected to result from diverting the urine from the bladder. When, for instance, the case was an inoperable one.

The latter point is one that the writer would lay special stress upon. It would seem reasonable to assume that much relief would be experienced from the absence of the repeated irritation of the filling and emptying of the bladder by the urine, which would be gained by the nephrostomy, and should this prove to be the case, it might under some circumstances be wise to go no further than that.

The great advantage, of course, in having done a preliminary nephrostomy is that, at the time of the bladder operation for the removal of the tumor, the whole question of the diverting of the urinary secretion and having to deal with the ureters is done away with. One would not have to think of that—the most difficult part of the operation—when attacking the tumor itself; moreover, the risks of the urine entering the peritoneal cavity would be avoided, and thus much less danger would be encountered in approaching the bladder transperitoneally, which would greatly facilitate the performance of the removal of the bladder and of the tumor and shorten the time required for it.

Thus far the writer has proceeded on the *assumption* of the superiority of nephrostomy as compared with ureteral implantation for effecting the same object. It remains to be shown on what grounds this opinion rests. To this end he has collected the data of ureteral implantation and of nephrostomy, which are given below in order to compare the

results of the one with the other with reference to the dangers and the disability attaching to each of the two procedures *per se.*

Results of Ureteral Implantation.—Total number of cases, 114.

	Cases.	Died.	Due to Implantation.
Maydl's operation for ectopia vesicæ	42	9	3
For injuries during abdominal operations	22	9	3
Implantation on abdominal surface	6	4	2
Implantation in loin	4	3	2
In connection with bladder resection	15	8	5
In connection with total extirpation for the removal of bladder tumor	25	14	6
	114	47	21

Operative mortality, 41.2 per cent. Due to ureteral implantation, 44.6 per cent. of fatal cases.

Results of Nephrostomy.—For the purpose of learning these results, the series of 626 cases collected by Schmieden have been taken and to it have been added 353 others collected by the writer, making a whole series composed as follows:

	Cases.	Died.	Mortality.
Complete renal retention with anuria	65	9	15.2 per cent.
Hydronephrosis	143	5	3.4 per cent.
Simple and calculous pyonephrosis	145	28	19.3 per cent.
	353	42	11.8 per cent.
Schmieden's series of nephrotomies done for various conditions of the kidney	626	102	16.2 per cent.
	979	144	15 per cent.

Maydl's operation for ectopia vesicæ may be taken as the nearest estimate which we can obtain of the dangers of ureteral implantation into the bowel, since the patients upon whom it has been performed have not been suffering from grave systemic conditions at the time. There is no means of judging the danger of nephrostomy upon like grounds, since it is never done except in the presence of disease and usually disease of a severe nature. The series of Maydl's operation has been included in the calculation of the percentages of deaths due to

ureteral implantation given above, but does not, of course, make the comparison a fair one to the results of nephrostomy. If the Maydl operation cases are omitted from the calculation, the operative mortality of the remaining 72 of the whole number becomes 50 per cent., while death was due to ureteral implantation *per se* in 50 per cent. of the fatal cases.

The difference between this and the mortality from any and all causes,—15 per cent.,—in the nephrostomy series, needs no comment.

It should be remembered also that in ureteral implantation into the bowel or onto the surface a considerable number of deaths results later from ascending renal infection, whereas it is very rare to have the kidney infected after nephrostomy, provided adequate drainage be maintained.

The opinions of Albarran and Legueu may be appropriately quoted here with reference to the dangers of renal incision and drainage.

Speaking of nephrostomy in connection with normal kidney and with reference to the question of what harm, if any, results from opening and draining it through the loin, Albarran speaks as follows:

"In these cases one is struck, first of all, with the absolute impunity which the incised and exposed renal tissue enjoys. The open kidney remains indifferent to contacts and pressures; foreign bodies which are introduced into or remain in it (drains, gauze, etc.) do it no harm; the lips of the renal incision may be pierced or drawn apart by retractors without injury, the interior of the organ may be curetted, injections of medicated fluids may be made, all without injury. The urine continues to be abundantly secreted and remains practically normal in character."

"All of which things show that nephrostomized kidneys are but very little liable to infection, and that the alterations of their parenchyma are but very slight; and, as a matter of fact, infection following this free communication of the interior of the kidney with the external surface of the body is very rarely followed by infection."

"When nephrostomy is done under different circumstances, in cases of renal retention, whether complete or incomplete, aseptic or septic, the same resistance to infection on the part of the kidney is seen, and the function of the organ is more or less perfectly resumed according to the amount of injury which it has sustained prior to the removal of the obstacle to the urinary outflow."

Legueu says, "In renal infections the dangers attaching to nephrostomy are, *per se*, almost nothing. The operation is necessary to have done under certain circumstances, and the dangers attending its performance are only such as are necessarily inherent in any operation that is performed in the presence of grave systemic conditions of any sort."

These statements reflect, I think, the opinions of most surgeons of experience in this matter. The objections, therefore, to lumbar nephrostomy are not on account of its dangers, but because of the disability and distress which are believed by many surgeons to be inflicted upon the patients.

I cannot help thinking that this impression is owing to the fact that there are very few cases indeed, if one may judge by those reported, in which such patients are properly cared for. The reports almost invariably refer to them as being discharged from the care of the surgeon without any proper provision being made for drainage or cleanliness. The majority of the patients have been of the laboring class, many of them of a low order of intelligence, and living in surroundings in which proper treatment of the fistulæ was impossible to secure. It is not remarkable, under such circumstances, that the renal fistula should be a source of distress to the patients and to others with whom they are brought in contact. It is not for such as these that the writer would propose to apply the plan he has submitted here. But when good care can be obtained, he is confident that maintaining renal fistula is not only compatible with a useful and an active life and with comfort, but that is is the safest course under the circumstances in which it is here proposed to employ the procedure, and that it is, moreover, the means of prolonging life and of preserving the good health of the individual upon whom it is practised.

That these things may be secured by the operation, the writer has demonstrated in one of his own cases in which *eleven years ago* he did a left lumbar nephrostomy for the relief of an acute pyonephrosis, and established a permanent fistula in that loin. Three years since, my colleague, Dr. Paul Thorndike, performed a similar operation upon the other kidney

of the same patient. For this individual the writer made a special apparatus of a very simple sort which the patient has continued to wear for the purpose of draining the two kidneys during the periods which have elapsed since the two operations. Not only has he remained in excellent health throughout this long number of years,—the last three with fistulæ in both loins—but he has led an active, busy life, has suffered no distress whatever, and no one but himself has been aware of the fact that he was living under such conditions. The urine from both kidneys is nearly normal.

Mr. Morris reports two similar cases, one of the patients having single, *the other double renal lumbar fistulæ,* and both patients were in excellent health and in comfort, 1 for 7 years and the other for 16 years.

In addition to these three cases, the writer has collected forty-four others, in which the subsequent histories of patients with permanent lumbar renal fistula is more or less fully reported. Of this series, there were 8 in which the reports state that the patients were in health, comfort, and leading active lives, but in which the length of the times subsequent to the operations was not noted. In 2 it was mentioned as being for several years, in 1 for 8 years, 1 for 7 years, 2 for 5 years, 1 for 4 years, 3 for 1 year, and 2 for 18 months. In 3 others infection occurred, secondary nephrectomies were done, one with fatal result. In four others the fistulæ closed spontaneously at the end of from one to two years.

The point that has not been touched upon as yet is the danger attending the preformance of bilateral nephrostomy. There are but very few data from which to estimate this in the human subject. Experiments upon animals are not to be relied upon for this purpose. We know that they give too unfavorable a view of the results of ureteral implantation, for example, while, on the other hand, the results of bilateral nephrostomy when done upon dogs may give too favorable an impression to allow conclusions with regard to the human being to be drawn from them. The cases in which *bilateral nephrostomy at one sitting* has been done upon the human subject are

as yet very few, and in all of them with which the writer is familiar the patients have had very grave renal and systemic conditions at the time. Thus, Reynier reports four in which the operation was done under such circumstances with fatal results, and consequently is pessimistic with regard to it. On the other hand, such things as the following stand in favor of the procedure in greater or less degree:

When the two kidneys have been nephrostomized with an interval between the two operations, the results have been excellent in the cases reported,—*e. g.*, the two cases of Morris and that of the writer cited above.

Again, we have seen a number of cases in which nephropexy on one kidney and exploratory nephrotomy on the other have been performed simultaneously with success.

Reginald Harrison has shown the relief afforded to renal congestion by simple splitting of the capsule or renal incision in cases of scarlatinal nephritis.

We know that the best means of saving life in cases of acute or chronic renal retention is by a promptly performed nephrostomy. The same thing has been shown to be true of cases of post-operative amuria following operations on the genito-urinary tract. The bearing of the above statments upon the writer's proposal is too obvious to call for discussion.

Technique.—There is little, if anything, novel in the manner in which I would suggest that the plan of treatment proposed by me should be carried out. Its details would necessarily vary a good deal in different cases. Speaking in a general way, in order to include the whole of the method by which it seems to me it could best be done, it may be described thus:

1. Lumbar nephrostomy, bilateral, or unilateral at first, and, if this operation were well borne, to be followed by the same on the other kidney later. *In either case an interval of four to six weeks before the bladder operation was undertaken.* Or, as an alternative in certain cases, inoperable malignant disease of the bladder, should the patient's condition be markedly improved by the diversion of the urinary secretion through the new channels, to be content to go no further than the performance of the nephrostomy.

In doing the operations upon the kidneys, *the ureters should be picked up and ligated at whatever point was the most convenient in each individual case, but preferably as close to the renal pelvis as possible.*

2. Total extirpation of the bladder to follow the nephrostomy one month or so later.

(*a*) Abdominal incision in the median line extending upward from the middle of the symphysis pubis and opening the peritoneal cavity.

(*b*) Place the patient in Trendelenburg posture, push the intestines away from the bladder, so that the latter is thoroughly exposed, and retain them there by packing with large gauze pads.

(*c*) Incise the peritoneum in the middle line over the summit of the bladder from the anterior insertion of the membrane to its posterior one. Strip the peritoneum off of the outer surface of the bladder, ligating the ureters when they are met. If there is any part of the peritoneum involved by the pathological process, resect that part and leave it upon the bladder. The ureters should be ligated as high up as possible.

(*d*) When the prostate has been reached, it should be removed together with the seminal vesicles and the bladder, if there is any doubt as to their being involved in the process; if not, they may remain. In the former case, the bladder being drawn as far upward into the wound as possible, a double ligature should be passed from behind forward with a long curved needle through the middle line of the urethra at the junction of the membranous and the prostatic portions, and each half of the organ should be tied in such a way as to include the blood-vessels on either side. A second ligature should then be passed in a similar manner a little anterior to the first one and tied. The tissues are then to be divided between the two ligatures, and the bladder removed.

(*e*) A better way to accomplish the removal of the organ would be to approach it from the perineum and from above the symphysis, doing a combined operation, separating the rectum from the prostate in the usual way,—*i. e.*, by dividing the tendinous centre, of the perineum and blunt or finger separation

between prostate and rectum. Ligating the structures transversely as just described above then proceeding to complete the removal of the bladder from above the symphysis as already described.

If the disease does not involve the prostate and vesicles, those structures may remain undisturbed. In that case the bladder would be cut across transversely between two ligatures, and the divided edges of the lower portion just above the prostate would be either left thus or sutured over the base of the prostate, as might be thought to be best.

There would seem to be no objection to removing the prostate and vesicles in all such cases as we are considering; the difficulties of the operation would not be materially increased, and there would be far less chance of leaving behind any of the diseased tissues.

(*f*) Cleanse the operative field, close the peritoneal opening, and ligate any bleeding points.

(*g*) Close the abdominal wound entirely and drain by the perineum, or nearly close the abdominal wound and drain through it *and* the perineal wound, which would be sutured partly.

The chief point that seems to the writer to be of interest in this manner of removing the bladder is that the approach from both the perineum and a free laparotomy offers so much greater facility for accomplishing the extirpation of the structures involved and secures much greater thoroughness than if the operation is undertaken extraperitoneally; while at the same time the bladder, not being opened at all, makes the risk of intraperitoneal infection much less than when the contrary is the case, as it is when done in the usual way of performing the operation.

As has been said, the proposal which I have now submitted, together with the reasons which have led me to make it, are put forward only as suggestions, since we have as yet no actual experience in the matter; but these seems to be good ground for believing that they may prove to be of decided advantage if skilfully applied. We must remember that the

means hitherto devised have been far from satisfactory, *and that we are dealing with a very grave condition at best.* The proposed method of dealing with these difficult cases would therefore seem worthy of a fair trial.

Appended are tables of 20 cases of myomata in which operations were performed, and of 25 cases in which total extirpation of the bladder has been done for the removal of ureteral implantation in connection with the removal of bladder tumors.

CASES OF MYOMA.

Operators.	Method of Operation.	Deaths.	No Recurrence.	Recurrence.
Tassi	Vaginal cystotomy.	0	.....	.....
Nicholich	Through perineal urethra.	Died in 5 months.	.....	.....
Karstrom	Suprapubic cystotomy; galvanocautery.	0	.....	.....
Gerard Marchand	Suprapubic cystotomy; tumor excised.	Died in 6 months.	None.	.....
Ramsay	Same.	0	.....	.....
Guyon	Same, removal with curette.	0	None.	.....
Dittel	Suprapubic cystotomy and excision.	1	.....	.....
Gibbons and Parker	Same, and removal with galvanocautery snare.	0	None.	.....
Terrier and Hartmann	Same, and enucleation of tumor.	0	.....	14 months; second operation, and recovery.
Nauman	Same, removal by morcellement.	0	.....	.....
Volkmann	Same, removal by excision.	1	.....	.....
Albarran	Suprapubic cystotomy and excision.	0	.....	.....
Polaillon	Transperitoneal suprapubic cystotomy.	1	.....	.....
Warholm	Suprapubic cystotomy and resection.	0	.....	.....
Verhoogen	Same.	1	.....	.....
Ceci	Same.	0	.....	.....
Kraske	Same.	0	6 years.	.....
Schatz	Through female urethra.	0	.....	Twice; 1 year, again at 6 months.
Jackson	?	0	.....	.....
Thompson	Urethral.	0	.....	In 2 months.

CASES OF TOTAL EXTIRPATION OF BLADDER FOR BLADDER TUMORS.

Operator and Date.	No.	Age.	Sex.	Disease and Situation.	Operation.	Ureteral Implantation.	Result, Recovery, Death.
Bardenheuer, 1887.	1	..	M.	Carcinoma.	Bladder extirpation.	Left, without any implantation; death not referable to ureteral implantation.	Died fourteenth day; uræmia, hydronephrosis (double); uræmia due to the operation.
Pawlik, 1888.	1	56	F.	Carcinoma.	Bladder extirpation.	Vaginal.	Recovery; patient was living and well at end of three years.
Kuster, 1891.	1	53	M.	Carcinoma.	Bladder extirpation.	Rectal.	Died fifth day; pneumonia; kidney pelves, ascending infection.
Kummel, 1890.	1	60	F.	.....	Bladder extirpation.	One through urethra by ureteral catheter, other not drained.	Died of shock next day.
Kossinski, 1894.	1	..	F.	Carcinoma.	Bladder extirpation.	Vaginal implantation.	Recovery.
Tuffier, 1895.	1	40	M.	Carcinoma.	Bladder extirpation.	Rectal.	Recovery; died fourteen months later; details of death lacking.
Giordano, 1895.	1	60	F.	Carcinoma.	Extirpation of bladder; ligature of internal iliacs; abdominal hysterectomy; nephrolithotomy; symphyseotomy.	Rectal.	Died of shock in twenty-four hours.
Chalot, 1898.	1	45	F.	Carcinoma, also of uterus.	Abdominal hysterectomy; ligature of internal iliacs; extirpation of bladder.	Rectal.	Recovery; one year later patient was living.
Vasilief, 1895.	1	30	M.	Carcinoma.	Extirpation.	Angle of abdominal wound.	Recovery; well four months later.
Giordano, 1897.	1	50	F.	Sarcoma.	Total extirpation of bladder and abdominal hysterectomy.	Into sigmoid flexure.	Died twelfth day; pyelonephritis.

Turetta, 1897.	1	33	M.	Carcinoma.	Extirpation of bladder.	Rectal.	Died sixteenth day; acute ascending renal infection.
Schede, 1898.	1	55	M.	Carcinoma.	Extirpation of bladder.	Rectal.	Died third day of shock.
Winiwarter, reported by Hogge, 1898.	1	45	M.	Carcinoma-	Removal of bladder and external genitals.	Rectal.	Recovery. Three years later, no recurrence; the patient was living in comparative comfort.
Krause, 1899.	1	17	M.	Tumor of bladder compressing the left ureter.	Extirpation.	Rectal.	Recovery; three and a half months later was in excellent health.
Lund, 1902.	1	57	M.	Carcinoma.	Extirpation.	Rectal.	Died fourth day; uræmia, acute ascending renal infection.
Harris, 1901.	1	53	M.	Carcinoma.	Extirpation, except a small bit of vertex of bladder.	Sutured to surface of suprapubic wound.	Died two months later of pneumonia.
Mayo Robson, 1903.	1	42	F.	Carcinoma.	Extirpation.	Vaginal implantation.	Died thirteenth day of uræmia.
Woolsey, 1903.	1	37	M.	Carcinoma.	Extirpation.	One ureter rectal implantation, the other drains through the suprapubic wound with a ureteral catheter.	Recovery; did well for six weeks, then failed, and died three and a half months after operation; ascending renal infection.
Kayser, 1903.	1	..	..	Carcinoma.	Extirpation.	Neck of bladder.	Died.
McCosh, 1903.	1	50	F.	Carcinoma.	Extirpation.	Ureters cut across an inch from the bladder and cut ends allowed to drain into retroperitoneal pelvic tissue.	Recovery. Fifteen months later, no recurrence; leading an active life.
McCosh, 1903.	1	..	..	Carcinoma.	Extirpation.	The same.	Recovery. Thirteen months later, no recurrence; leading an active life.

CASES OF TOTAL EXTIRPATION OF BLADDER FOR BLADDER TUMORS.—*Concluded.*

Operator and Date.	No.	Age.	Sex.	Disease and Situation.	Operation.	Ureteral Implantation.	Result, Recovery, Death.
George Tulley Vaughan, 1903.	1	32	M.	Sarcoma.	Extirpation by combined perineal and suprapubic incisions; recti muscles insertions with portions of bone attached divided from pubes. Abdomen opened by median and right angle incision above pubes.	Sigmoid.	Died at end of operation; shock and hæmorrhage.
Lindner, 1895.	1	..	M.	Carcinoma.	Extirpation.	Urethral; ureters did not drain.	Operative death; cancer of kidney was associated with that of bladder.
Zeller, 1896.	1	56	F.	Carcinoma.	Extirpation.	Vaginal.	Died in twenty-four hours of shock.
Göpel, 1897.	1	67	M.	Carcinoma.	Combined suprapubic and perineal operation.	Urethral.	Died of shock.

Deaths, 14. One later death = 15 total deaths. Operative mortality = 56.3 per cent. Directly referable to ureteral implantation = 5, and two others, in one of which uræmia was cause of death fourteenth day, and pneumonia and renal infection in the other, fifth day.

TABLE OF CASES OF BLADDER RESECTIONS FOR THE REMOVAL OF MALIGNANT TUMORS OF THE BLADDER IN WHICH DIVISION OF THE URETER, ONE OR BOTH, AND IMPLANTATION INTO BLADDER WAS DONE.

Cases.	Sex and Age.	Ureteral Implantation and Manner of Treating Bladder.	Recoveries.	Subsequent Result and Causes of Death.
1. Bardenheuer, 1891.	.....	One ureter into remainder of bladder.	Recovery.	Death five months later due to recurrence. Ureteral orifice not contracted.
2. Albarran, 1894.	M. 50	One ureter into the bladder. Symphyseotomy.	Recovery.	Fourteen months remained in good health. Recurrence then appeared to take place.
3. Rehn, 1895.	M. 49	One ureter into bladder. Bladder closed. Wounds healed at end of six weeks. Operation, extraperitoneal.	Recovery.	Died of recurrence not long after having recovered from operation.
4. Kuster, 1896.	M. 32	Extraperitoneal operation. One ureter into bladder. Bladder closed.	Recovery.	Three months later was well. No further report.
5. Mikulicz, 1903.	F. 46	One ureter into bladder. Bladder closed.	Recovery.	One year later was free from recurrence and in good health. Bladder function was satisfactorily performed.
6. Mikulicz, 1903.	M. 50	Same, except that bladder was left open enough to drain. One-half of bladder was removed.	Recovery.	At end of one month, spontaneous urination. Later report lacking.
7. Berg, 1904.	F. 32	One ureter into bladder. Vaginal drainage of field of operation. Bladder closed.	Recovery.	Great improvement after operation, but at end of eight months recurrence.

FATAL CASES.

Cases.	Sex and Age.	Operation.	Result.	Causes of Death.
1. Giordano.	F.	Bilateral implantation into bladder.	Died thirteenth day.	Pelvic cellulitis and bilateral ascending renal infection.
2. Schilling, 1890.	M. 71	Extraperitoneal operation. One ureter into bladder. Closure of bladder. Hysterectomy done at same time.	Died fifth day.	No peritonitis. Death due to shock, chiefly. No renal infection.
3. Bardenheur, 1894.	M. 54	One ureter into bladder. Bladder and wound tamponed. Extraperitoneal operation.	Death shortly after operation.	Shock.
4. Schuchard, 1894.	F. 32	One ureter into bladder. Bladder tamponed.	Death tenth day.	Partial suppression of urine and uræmia.
5. Helferich, 1896.	F. 36	Combined suprapubic and perineal exposure of the bladder. Bilateral implantation into bladder. Bladder closed.	Death fifth day.	Shock and ascending renal infection.
6. Albarran, 1896.	F. 51	Symphyseotomy to expose bladder. One ureter into the bladder. Bladder closed.	Death thirty-six hours.	Shock.
7. Israel, 1891.	M. 46	One ureter into bladder.	Death sixth day.	Ureteral implantation failed to hold. Pelvic cellulitis resulted.
8. Israel, 1891.	F. 39	Both ureters into bladder.	Death twenty-four hours.	Shock.

Total number of cases, 15. Deaths, 8. Due directly to ureteral implantation, 3, or 20 per cent.

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SARCOMA OF THE BLADDER.

REPORT OF A CASE OCCURRING IN A CHILD FOUR YEARS OLD.

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In an article published in 1890, Dr. Vanderveer stated that, after an extended examination of the literature of vesical new growths, he had been able to collect the histories of only twenty-two cases occurring in childhood. "Of the malignant tumors of the bladder, the case of medullary cancer occurring in a child four years old reported by Smythe stands alone as the only instance of primary malignant growth in childhood confirmed by the microscopic examination. Secondary sarcoma from the vagina has been reported three times. Billroth's justly celebrated case of myxosarcoma and carcinoma and another case of fibrosarcoma are the only instances of mixed growth that have been reported."

My patient, a male, four years old, entered the University of Michigan Hospital, July 10, 1902, because of difficult urination. In February, 1902, the urine was first noticed to have a red appearance. This lasted but a short time, but reappeared in April, when it was examined by the attending physician, and found to contain blood. In May the patient began to have difficulty in passing urine, the bladder becoming distended, then emptying itself by spurts. He was catheterized for a time by the attending physician, and then was taken to a hospital in a neighboring town, where, for a presumed spasm of the urethra due to an irritable prepuce, he was circumcised. From that time until he entered the University Hospital he was catheterized twice daily. Upon admission the urine was quite thick with a heavy deposit, which was mostly pus. He could pass urine without a catheter only when the bladder was overfull, and then it caused great pain, passing in spurts.

July 14, 1902, he was anæsthetized with ether and the bladder carefully examined for stone. Examination negative. He was then put in the lithotomy position, a staff was introduced as a guide, and the bladder was opened by a median incision. A rubber tube was inserted for continuous drainage. The bladder was irrigated twice daily through the tube with normal salt solution. The cystitis rapidly subsided, and twenty-six days after the operation the urine was apparently normal and the wound healed. A few days later, the difficulty in passing urine returned, and he grew rapidly worse. A fragment of tissue was passed with the urine, which suggested a growth in the bladder. The pain, discomfort, and loss of sleep were making him very weak, and a second operation was performed on November 3, 1902.

A median perineal incision was made in the old scar, through which a mass could be felt, but it was so large that another incision was made above the pubes to secure a better field for operation. A finger inserted in this opening could be swept around a mass of soft tissue as large as an apple, which was easily broken down. It was everywhere free except at the posterior wall and base of the bladder. The tumor was excised and removed, the entire growth weighing eight ounces. Extreme care was taken to remove all of the growth that could be detected. The free hæmorrhage was readily controlled by gauze compression. The incision in the anterior wall of the bladder was partially closed with two sutures and drainage-tubes were placed in both openings.

The growth, microscopically, presented for the greater part the structure of a myxolipoma, very vascular, and in areas so rich in cells as to have the appearance of sarcoma. Angiomatous areas were also present. The growth was polypoid, the surface being covered with a stratified epithelium which in some areas resembled the epidermis, the outer layers of cells having a distinct horny appearance (Figs. 1 and 2). *Diagnosis.*—Myxoliposarcoma, probably congenital. The bladder was irrigated twice daily with normal salt solution, and recovery progressed so rapidly that the tubes were removed on December 15. Ten days later he left the hospital apparently cured. The trouble appeared again in May, 1903, and he returned to the hospital for an operation, which was performed on June 1. The bladder was opened by a suprapubic incision, and the walls were supported by two strong

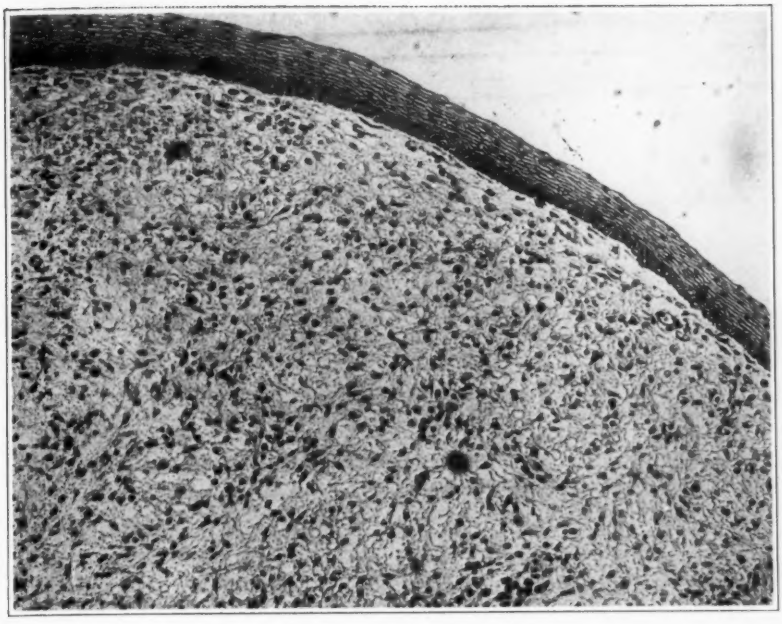

FIG. 1.—Removed at second operation. Area presenting structure of a myxoma covered with stratified flattened cells, the outer ones resembling those of the horny layer. × 175.

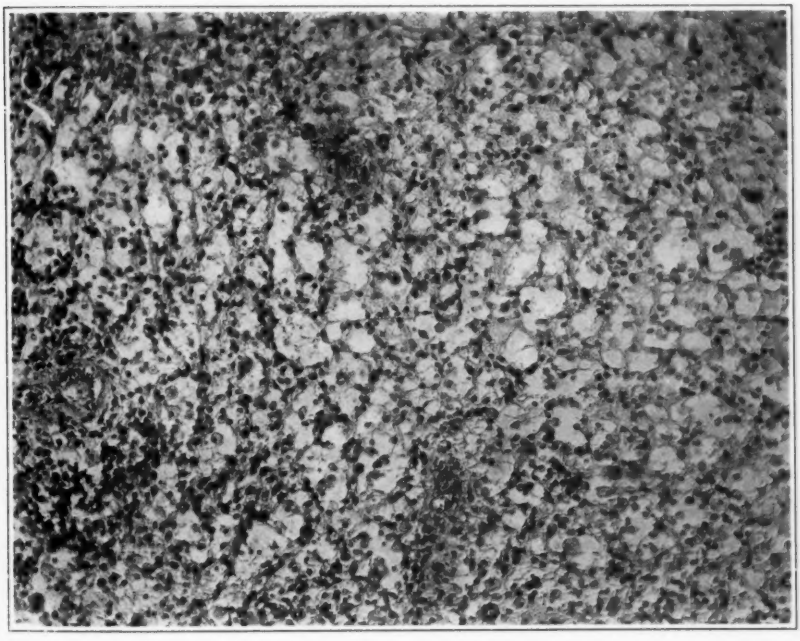

FIG. 2.—Removed at second operation. Structure of lipomyxosarcoma. × 175.

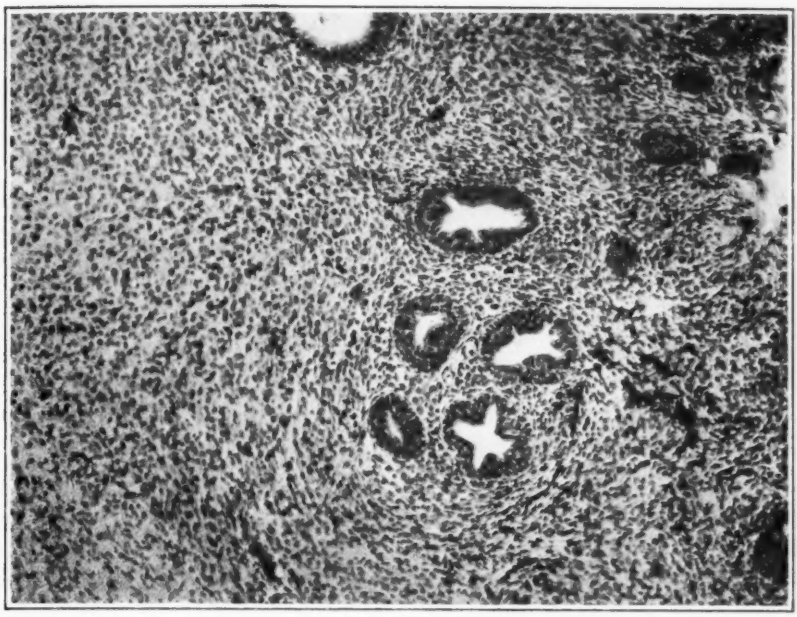

FIG. 3.—Removed at third operation. Gland-like structures in sarcoma of bladder (adenosarcoma). × 175.

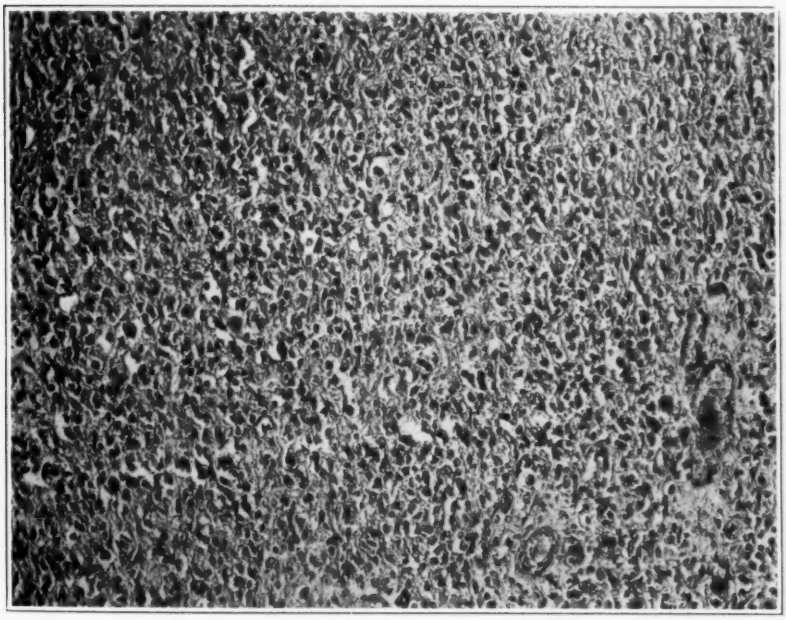

FIG. 4.—Removed at fourth operation. Polymorphous-celled character. × 175.

anchor sutures. The tumor was much firmer to the touch than the one previously removed and nearly filled the bladder.

The point of attachment to the bladder seemed much smaller and more easily defined, occupying the base and extending well up the sides. The growth was broken up with the fingers and the pedicle portion cut away as much as safety would allow with a sharp curette. The severe hæmorrhage was controlled by packing with iodoform gauze; the wound was left open.

Section of this tumor showed a growth of more cellular character than the one removed at the previous operation, the character of the tumor being that of myxosarcoma. Numerous gland-like tubules and spaces are seen throughout the sarcomatous tissue. Some of these are lined with transitional epithelium, others by tall columnar cells. It is evident on serial section that some of these spaces represent blind tubules, while others are continuous with the surface epithelium. The appearances presented by the greater part of the growth are those of adenomyxosarcoma (Fig. 3).

Once more he made a good recovery and left the hospital in July, but returned again on the 22d of August with a history as follows: About two weeks ago he began to pass his hand frequently across the lower part of the abdomen as if in pain, stopping to do this while at play. A week later the urine began to dribble. He was seized with severe spasmodic pain in the bladder, which has continued ever since. The spasms last about fifteen to thirty seconds, coming from one to five times an hour. He draws the knees towards the chin, kicks, cries out, and passes a small amount of urine. He has no control of the bladder; there is either retention or involuntary passage of urine.

The fourth operation was performed August 31, 1903. The bladder was again opened above the pubes, exposing a large pear-shaped growth, the small portion corresponding to the pedicle. The tumor could not be brought up into the wound, so the incision was continued above, opening the peritoneal cavity. The intestines were pushed upward and held in place by a gauze pack, while a hand passed behind the bladder raised it to a more convenient point for operation, and at the same time enabling the operator to guard against penetrating the bladder-wall with the cutting instrument which was used on this occasion. The tumor, firm and smooth, was rapidly cut away with a Fuller's prosta-

tectomy forcep. Every effort was made to remove all of the bladder-wall from which it grew. The patient was in a dangerous condition from the loss of blood at the completion of the operation, and saline solution was employed subcutaneously. The bleeding was controlled by packing with iodoform gauze.

Pathologist's Report.—The growth is more cellular in character than in previous specimens, in parts having the appearance of spindle-celled sarcoma, in others of a polymorphous-celled sarcoma. No gland-like tubules found. In the polymorphous-celled areas there is a distinct reticulum in the spaces of which the cells lie. This reticulum is for the greater part firm, stains red with Van Gieson's, and is myxomatous in character in only a few places. The growth is very vascular. The diagnosis best fitting the greater part of the growth would be that of polymorphous-celled sarcoma (Fig. 4).

The patient remained very weak for days, but finally rallied. The abdominal wound healed without any serious peritonitis, but an abscess formed in the incision just above the bladder, which persisted until death. The tumor returned, enlarging rapidly, and was soon pressing upon the ureters. Signs of general sepsis appeared, the patient gradually sinking. He died November 26, 1903, one year and four months after first entering the hospital.

Autopsy Protocol (Autopsy by Dr. Warthin).—The body was examined a few hours after death. Just above the pubis there is a rounded, somewhat flattened, lobulated mass 8 centimetres long and 6½ centimetres wide, and variegated in color from dark red to yellowish white. On separating the larger lobes, smaller lobules are found beneath them. The surface of the lobes is covered with a sticky fluid. The tissue composing them is semi-elastic. The entire mass presents through an opening in the anterior abdominal wall between the umbilicus and the pubis. On the right side the tumor is entirely free from the edge of the opening and the fingers can be passed beneath the lobes into the peritoneal cavity. On the left the growth is adherent to the edge of the opening in the wall and to the root of the penis below. On passing the hand into the peritoneal cavity upon the right side, the pelvis appears to be filled with lobulated masses continuous with those presenting through the opening in the abdominal wall.

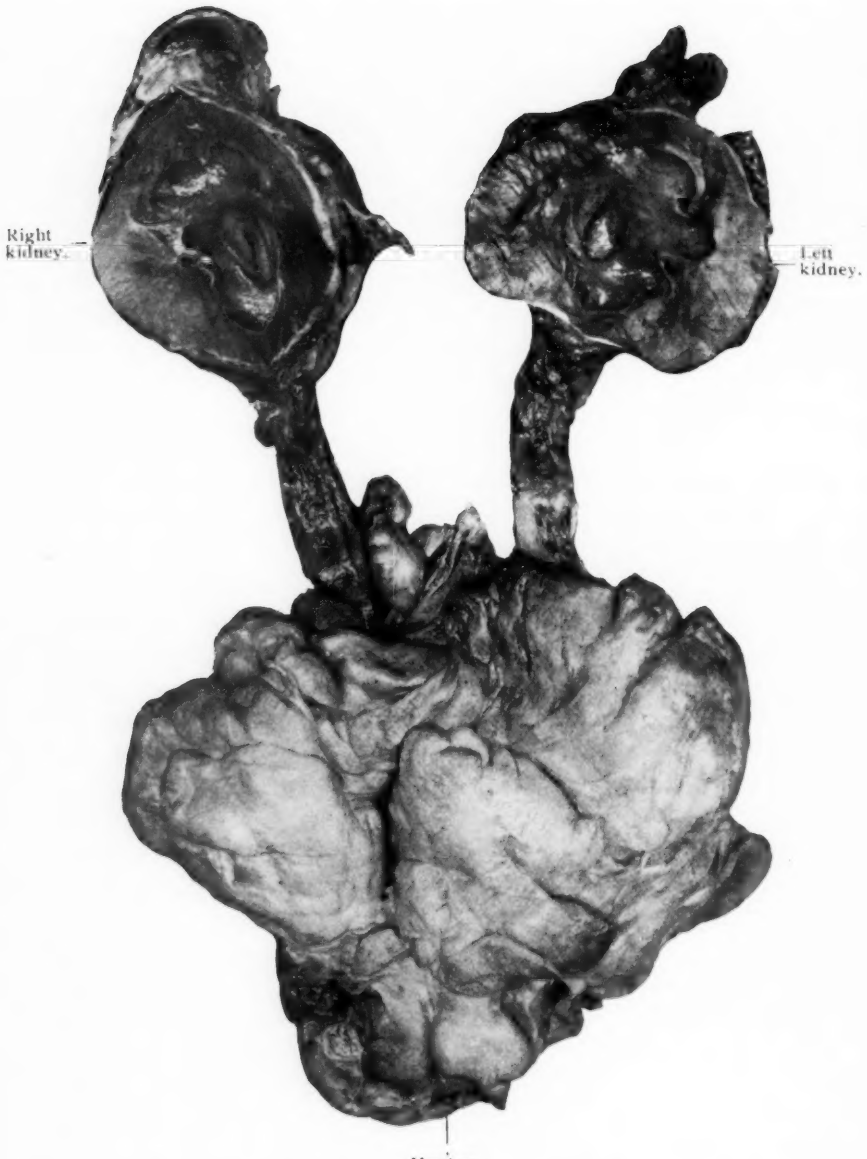

FIG. 5.—Sarcoma of bladder; dilatation of ureters; pyelonephritis.

The large tumor mass in the pelvis is entirely within the bladder, and extends through an opening in the anterior abdominal wall. It is firmly adherent to the pubis, and upon its lower margin and left side to the abdominal wall. The lobulated masses fill the cavity of the enlarged bladder and apparently spring from its fundus and posterior wall.

Adrenals, kidneys, ureters, bladder, and external genitals removed in one piece (Fig. 5). Both adrenals atrophic. The kidneys are very irregular in shape, the pelves being greatly dilated. On section the cortex of both is very atrophic. The labyrinths are enlarged, cloudy, and of a yellowish color. In the cortical portions of both there are small, yellowish, wedge-shaped areas with base towards the surface of the cortex. No metastasis recognizable by the naked eye. The medullary pyramids of both are atrophic and contain yellowish stripes corresponding to the straight tubules. The pelves are enormously dilated and filled with purulent fluid; mucosa thickened and covered with thin pus. In the upper pole of the right kidney there are firm translucent areas suggesting the presence of amyloid. Iodine test not used. Both ureters are greatly dilated, walls thin. At the brim of the pelvis both are pressed upon and constricted by lobules of the tumor which rest upon the pelvic brim. The dilatation is as marked below the points of constriction as above them. The left ureter has a tortuous course and is pushed far to the left at the brim of the pelvis. No extension of the tumor into the ureters can be found, but the openings into the bladder are blocked by the growth arising from and infiltrating the bladder-wall. The bladder is opened anteriorly. Its cavity is almost entirely filled with lobulated polypoid masses springing from the entire posterior wall and base. Here the entire mucosa and submucosa are infiltrated by the growth, the infiltration apparently not extending into the muscularis. The cut surface of the tumor is smooth, moist, and shining, of a whitish color and almost homogeneous. A few of the smaller lobules lying between the larger ones are translucent and jelly-like. The posterior urethra is greatly dilated, small tumor masses extending from the main mass down into the urethra and blocking its lumen. These present on section the same characteristics as the main mass. They are adherent to the posterior wall of the urethra, but not to the anterior. The posterior wall and the prostate show some infiltration. Tes-

ticles atrophic, otherwise negative. The retroperitoneal glands are prominent but not distinctly enlarged. No evidence to the naked eye of metastases. The hæmolymph glands cannot be distinguished. The mesenteric glands are slightly enlarged, the largest found in the neighborhood of the appendix. Section negative.

Microscopical Examination.—Material was taken from all the organs and tissues as well as from the tumor and fixed in alcohol, formalin, mercuric chloride, Zenker's, etc. The chief material was embedded in paraffin. The ordinary stains were used, and in addition special methods for mucin, fibrin, etc.

Tumor.—Section presents the appearance of a very cellular spindle-celled sarcoma with small areas of caseation necrosis. The bladder-wall is diffusely infiltrated, the infiltration extending through the muscularis into the surrounding tissues. The striped muscle in the neighborhood of the bladder is also infiltrated. There is also a diffuse infiltration of the wall of the urethra, the epithelium being preserved over the tumor. The more translucent parts of the growth are myxomatous (Figs. 6, 7, and 8).

Kidneys.—Ascending pyelonephritis with multiple abscesses, marked dilatation of pelves and collecting tubules. Areas of chronic interstitial nephritis and amyloid. No metastasis found.

Retroperitoneal Glands.—Atrophic. In one gland a small metastasis about the size of a mustard-seed was found. In structure it resembled in all respects the primary growth in the bladder (Fig. 9).

Pathological Diagnosis.—Congenital sarcoma of bladder (adenosarcoma becoming a simple histoid sarcoma of the spindle-celled variety). Metastasis in retroperitoneal gland. Dilatation of ureters due to obstruction and compression. Ascending pyelonephritis. Chronic interstitial nephritis. Beginning amyloid degeneration. Atrophy and passive congestion of all organs. Fatty degeneration and infiltration of liver. General marasmus.

A classification has been made of all reported cases of sarcoma of the bladder that I have been able to find and verify. There are eighteen cases including my own. It will be seen that the true condition of some of these was not discovered before postmortem. Of the eight cases operated only

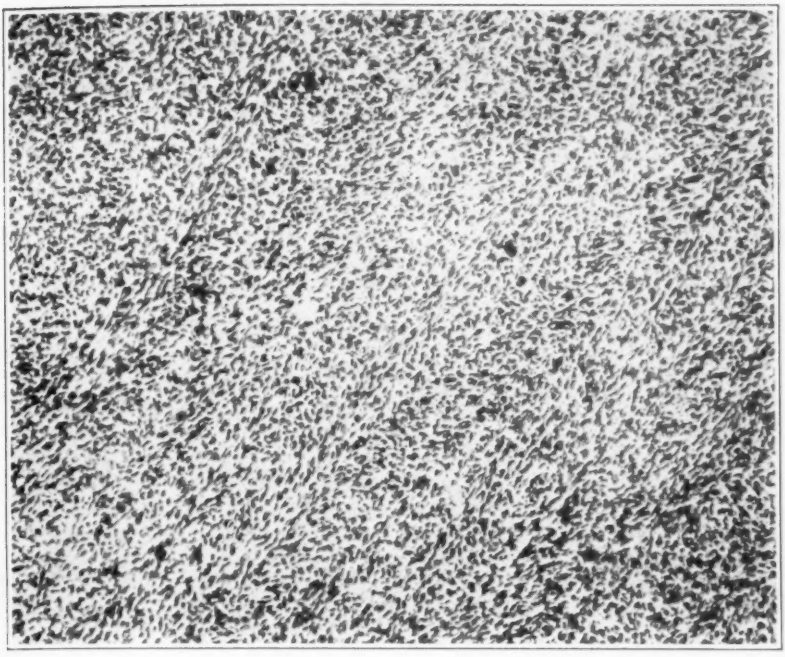

FIG. 6.—Removed at autopsy. Primary spindle-cell sarcoma of bladder. × 150.

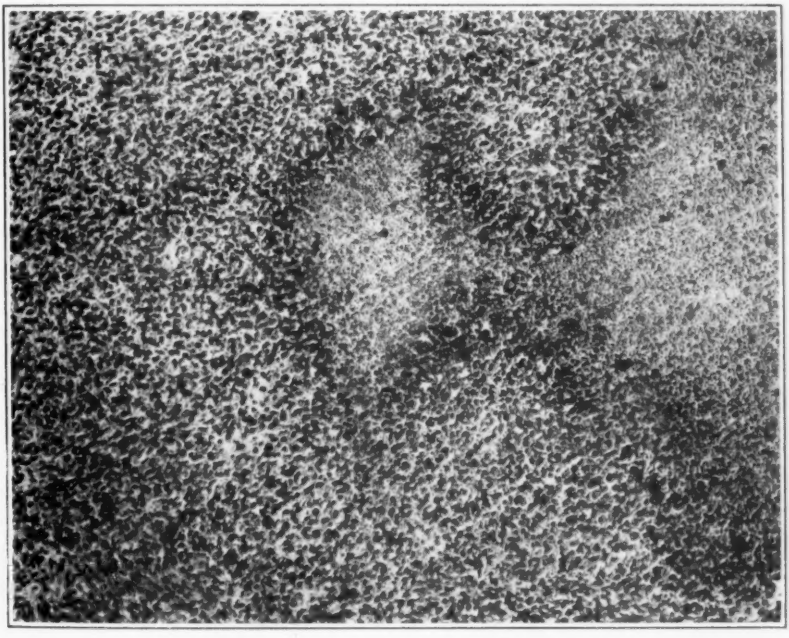

FIG. 7.—Removed at autopsy. Necrotic areas in primary sarcoma of bladder. × 175.

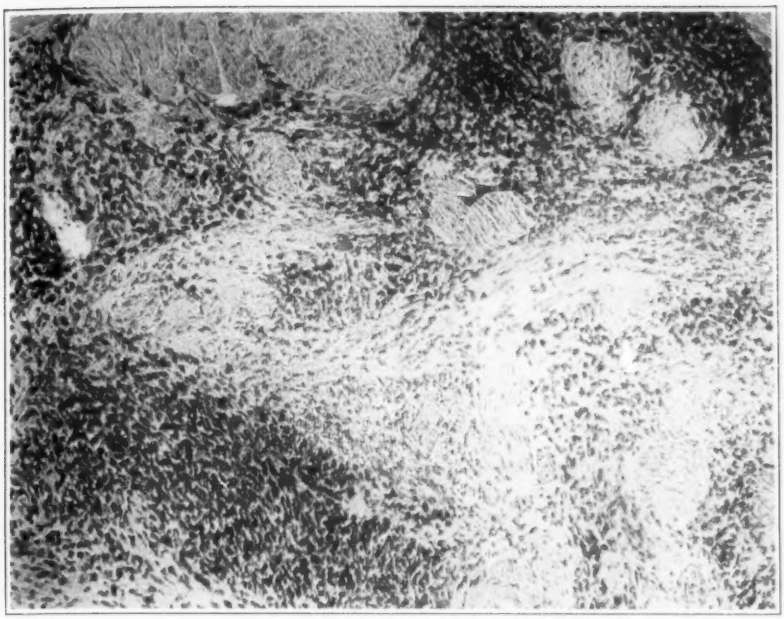

FIG. 8.—Infiltration of bladder-wall by tumor. × 175.

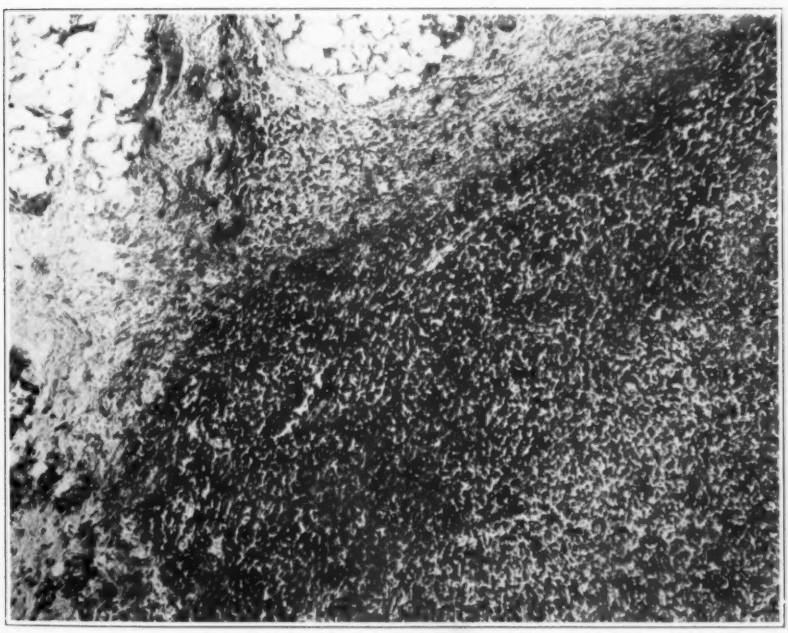

FIG. 9.—Metastasis in retroperitoneal lymph-gland. Small sarcomatous nodule just beneath the thickened capsule of the gland. × 175.

one lived (Gussenbauer). Three of the operated cases were females, and the operation consisted in removing only that part of the growth which could be reached by the urethra. The operation in one male consisted in opening the bladder for drainage. Two were operated by combined suprapubic and perineal incisions.

The result so far obtained by operation would indicate that the only hope of success in these rare cases lies in the entire removal of the bladder.

ABSTRACT OF CASES FROM LITERATURE.

I. GUERSANT.—A female, one year and ten months old. A portion of the tumor was removed through the urethra. Death seventeen days after operation.

II. GUSSENBAUER.—Male, twelve years old. The tumor was removed by combined suprapubic and perineal incision. The wounds were entirely healed at the end of four weeks.

III.—SEIWART.—Female, three years old. The tumor was removed three times, but rapidly returned, causing death.

IV. BUTLIN.—Female, four years old. Removed many times by the urethra. Patient died.

V. FENWICK.—Male, eight years old. Operated twice by perineal incision and died six months after the last operation.

VI. MORGAN.—Male, eight years old. The operation in this case consisted in opening the bladder for drainage. The patient died four days later.

VII. CHAFFEY.—Male, one year and eight months old. Operated by perineal incision. The patient died ten days after operation.

VIII. CHIARI.—Male, five years old. There was no operation. The patient died from hæmaturia.

IX. LOSTALOT.—Male, four years and six months old. No operation. The patient died from infection.

X. D'ARCY POWER.—Male, a child. No operation. The patient died.

XI. DETTRICH.—Male, one year and nine months old. No operation. Death.

XII. ALBARRAN.—Female, a child. No operation. Death.

XIII. ALBARRAN.—Female, four and one-half years old. No operation. Death.

XIV. FROLICH.—Female, four years old. Not having access to the original paper, I am not able to complete the report.

XV. LOHR.—Female, three and one-half years old. Operated, but died.

XVI. STEINMETZ.—Male, two years and nine months old. There was

no operation. The patient died about two months after entering the hospital. The post-mortem report of this case is quite complete.

XVII. McConnel.—Male. nine months old. The true condition of this case was found at postmortem. No operation.

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RUPTURE OF THE MALE URINARY BLADDER.[1]

WITH AN ACCOUNT OF THREE CASES

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RUPTURE of the bladder is a rare injury. Surgeons of large experience have been known to spend a lifetime in the active practice of their profession without meeting a case of the kind. In view of the fact that this accident is an emergency that may be encountered by the physician at any time; and that, moreover, the best methods to be adopted in order to arrive at a definite diagnosis, as well as the proper treatment to pursue, are still *sub judice*, we venture to hope that an account of the three cases that come under our supervision will not prove uninteresting.

The literature on this subject shows that about four cases are reported annually. It is, however, possible, that this figure underestimates the number that actually occur. As will be shown later on, rupture of the bladder may occur without the manifestation of any of the symptoms typical of the condition. Again, this accident may supervene and three or four days elapse before the individual becomes aware that he is seriously injured. As a result, death from peritonitis follows, and when an autopsy is denied, the demise is ascribed to some cause other than injury of the bladder. No doubt, in a small proportion of cases, no report is made, so that there is probably a percentage of which there is no record.

Owing to the infrequent occurrence of this injury, it naturally follows that no one person can be looked upon as an

[1] Read before the American Association of Genito-Urinary Surgeons, June 13, 1905.

authority on the questions regarding diagnosis and treatment, which are still unsettled. It is only by the accumulation of data gleaned from the experience of those who have been fortunate enough to encounter cases of the kind that these points can be definitely determined.

Men are much more liable to this accident than are woman. Dr. Harrison (*Dublin Journal of Medical Sciences*, vol. xl) believes this to be due to the greater size of the female pelvis, the position of the bladder, as well as the shortness and distensibility of the female urethra; the canal acting as a safety-valve, permitting the bladder to be rapidly emptied when suddenly compressed. As rupture of the bladder is most commonly the result of traumatism, occupation would render woman less liable than man to an accident of the kind. This injury is seldom seen in children. A case of the kind occurring in a girl five years of age is reported by Robinson (*Lancet*, January 23, 1904).

Rupture of the bladder may be of idiopathic or of traumatic origin, the latter being by far the most frequent. The rent may be intraperitoneal; extraperitoneal; partially extraperitoneal and partially intraperitoneal; partially, where the mucous coat alone gives way; or subperitoneal, in which case both the mucous and muscular walls of the viscus are torn. This classification of the subject is adopted by most writers. The present writer believes the last three varieties to be extremely rare, for, after an extensive review of the reports of a large number of cases, he has, with one or two exceptions, been unable to find any that were not either purely intraperitoneal or purely extraperitoneal. For obvious reasons the former variety is by far the most common. All writers agree that this accident to the bladder is most likely to occur when the organ is distended; on the other hand, it may occur when the viscus is empty.

Routh reports a case (*British Medical Journal*, September 21, 1901) in which the injury followed a blow on the abdomen, the individual having emptied the bladder just before the accident occurred. Cabot, writing on this subject, states (" Refer-

ence Hand-Book of Medical Sciences," first edition, vol. i): "Great violence to the hypogastrium is capable of producing a tear in the anterior wall of an empty bladder. The accident is to be explained as follows: The force applied to the hypogastrium carries the upper portion of the bladder, which is attached to the abdominal wall by the peritoneum, and urachus violently backward. The lower portion of the bladder is held by the prostate, which is fixed by the pelvic fascia, and consequently a rent occurs in the anterior vesical wall just above the prostate. This is often accompanied by a considerable stripping-off of the peritoneum." He adds further: "Intraperitoneal ruptures uncomplicated *can only occur when the bladder is full.*"

A few cases are recorded where more than one rupture the vesical walls has been found, but this is very rare. Although writers speak of a rent in the mucous coat of the viscus alone, we are convinced that this accident must be but very seldom encountered, for in no instance were we successful in finding a report of a case of the kind. If such an injury should occur, a diagnosis would be impossible without the aid either of a cystoscopic examination or of an exploratory suprapubic cystotomy. Reid reports a case of rupture of the mucous and muscular layers giving rise to a diverticulum composed of the peritoneal covering. An injury of this description is prone to be followed by peritonitis.

E. Ullman (*Wien. med. Woch.*, 1888) studied the subject of surgical and accidental rupture of the bladder experimentally. His investigations differed from those of Dittel in 1886, in that the abdominal wall was left intact at the time the experiments were made. As a result of his observations, he concluded that laceration of the peritoneal layer was most apt to occur, that of the muscular layer next, the mucous coat being most resistant. When the rectum was distended, by means of a colpeurynter, at the same time as the bladder, the rent was always found to be in the posterior wall of the organ, a fact worth bearing in mind when the rectum and the bladder are both distended previous to performing suprapubic cys-

totomy. It was discovered that the amount of distention of the bladder that could be effected without causing rupture varied widely in different conditions; that in rupture was more likely to occur in cases of cystitis than when the organ was in a healthy condition. In one instance rupture of an inflamed bladder occurred after 360 cubic centimeters of fluid had been injected. In a normal bladder, 1700 cubic centimetres of water were injected before rupture took place. In one case Ditelt injected 5000 cubic centmetres of water before rupture occurred. Knowledge gained by the study of these experiments has a most important practical bearing. It teaches that when it becomes necessary to perform a suprapubic cystotomy in those cases in which a chronic cystitis exists, there is always greater danger of rupture of the organ than if the operation is undertaken with the bladder in a normal condition. Furthermore, the danger is enhanced if the rectum is likewise distended at the same time. Clinical experience is not in accord with the statement of Ullman that the rent is most likely to take place in the posterior wall of the organ. In ten cases of which we have the notes, in which rupture of the bladder occurred preparatory to a suprapubic operation, the tear was extraperitoneal.

A case of this kind was reported by John A. Wyeth (*New York Medical Journal*, October 19, 1901) in which chronic cystitis necessitating drainage existed. The bladder was distended with fourteen ounces of water, whereupon rupture, with extravasation of urine into the space of Retzius, took place. Nine similar cases are reported by Ullman; two by Weinlechner; one each by Donod, Perier, Guyon, Ditelt, Ullman; and two from Albert's clinic. Rupture occurred after injecting respectively "150, 250, 200, 100, 200, 180, 400 cubic centimetres of fluid." Rupture was extraperitoneal in seven of the cases. Six submitted to the high operation, with three deaths; two were treated by means of catheter drainage, with one death and one recovery.

We are convinced, after an experience with over three hundred suprapubic cystotomies, in which both the bladder

and the rectum were distended by what is known as "the Garson-Peterson method," and from which no untoward results followed, that if ordinary precautions are taken in distending the bladder, rupture of the vesical walls will not occur. We believe that the rectal bag should not be employed unless the lower bowel is in a healthy state. The Peterson bag should be a small one, one not capable of holding more than ten ounces. We have seen surgeons insert a large bag and inject as much as twelve or fourteen ounces of fluid; in some instances the quantity of water that was required to dilate it was not even measured. This practice is most reprehensible, and cannot be too strongly condemned. Before the patient is brought to the operating table, and before the anæsthetic is given, the surgeon should ascertain the exact capacity of the patient's bladder. We have frequently seen the bladder of a patient under the influence of ether distended, without any previous investigation having been made in order to determine how far the organ could safely be distended with fluid. It is an invariable rule with us to distend the bladder and ascertain its capacity the day before the operation. If eight ounces of water can be retained comfortably without giving rise to pain, under no circumstances should more than nine ounces of fluid be injected into the organ after the patient is under the influence of the anæsthetic. With attention to these simple details, we are convinced that rupture of the bladder preceding a suprapubic cystotomy will seldom, if ever, be encountered. Space will not permit of a consideration of all the causes that give rise to rupture of the bladder. The accident may be associated with a fracture of the pelvis or be due to a direct blow on either the distended or the contracted organ; in the latter case it occurs but rarely. Idiopathic rupture may occur in cases of long-standing disease of the bladder, associated with stricture of the urethra, hypertrophy or atrophy of the prostate gland, or the presence of stone; one case reported followed the use of the aspirating needle. The accident occasionally occurs where both the bladder and the rectum are distended preparatory to a suprapubic cystotomy; in a few instances it has been known to take place spontaneously, the result of muscular

action. It occasionally occurs during pelvic operations. Alcoholism, as is well known, predisposes to the accident. M. Houel says, regarding this subject ("Des Plaies et des Ruptures de la Vessie," Paris, 1857): "Alcohol has a double influence in predisposing to this injury, for it causes an increased and rapid secretion of urine, and quick distention of the bladder; it also dulls the sensibilities of its mucous membrane, and the call to micturate is so feeble that it is disregarded by the drunkard, and the distention is allowed to increase, so that a man under the influence of liquor, with relaxed muscular system and distended bladder, who receives a blow on the abdomen, is extremely liable to sustain a rupture of one or more of the coats forming the vesical walls." It should always be borne in mind that rupture may take place from violent muscular action, in which case there will be neither evidence nor history of abdominal injury to account for the symptoms. Many interesting cases of the kind are recorded. Reginald Harrison ("Lectures on Surgical Disorders of the Genito-Urinary Organs," second edition) cites a case where the injury followed prolonged retention of urine. At the post-mortem examination no evidence of urethral obstruction could be found. A somewhat similar case is recounted by Havas ("Prest. Med.-Chir. Presse," October 27, 1901). In this case *prolonged retention* was attendant on *atrophy of the prostate gland*. The retention had existed for four days previous to the patient's admission to the hospital; at the time of his entrance he was in a state of collapse. The autopsy revealed a tear one inch long in the posterior wall of the bladder. When a patient is admitted to an institution in the condition just described, and no history is obtainable, it is easy to conceive how difficult it might be to make a diagnosis as to the cause of his symptoms. Gouley describes a case ("Diseases of the Genito-Urinary Organs") in which rupture of the bladder took place in a case of retention of the urine associated with rupture of the urethra. During the administration of ether the individual became greatly excited and struggled violently. Suddenly the abdominal tumor disappeared.

One case of idiopathic rupture of the bladder in which

the organ was extensively diseased and contracted on a calculus of large size has come under the writer's notice. The history of the case is briefly as follows:

CASE I.—The patient was seen, in consultation with a physician, in a neighboring town. He had been a sufferer from bladder trouble for about four years. On examination, a large calculus was discovered in a thickened and contracted bladder. Suprapubic cystotomy under local anæsthesia was advised. The patient consented to submit to the operation, but stated that he would not be ready to have it performed for at least a week. Five days later his physician telephoned the writer that he had been called to see his patient and found him in collapse, suffering violent pain over the whole of the lower portion of the abdomen; there was great desire to micturate, without the ability to perform the act. The catheter withdrew a small amount of bloody urine. Operative interference was not permitted. The patient died in twenty-four hours. At the autopsy a contracted and thickened bladder, containing a stone that almost completely filled the cavity, was discovered. The ureter on the left side was greatly thickened, the kidney being the seat of multiple abscesses. The kidney on the opposite side showed changes due to chronic nephritis. An intraperitoneal rupture, about one and one-half inches in length, was found on the posterior wall of the bladder.

A case was reported by Rowers (*Jour. de Chir. et Anns. de la Soc. Belge de Chir.*, No. 5, 1902), of a phosphatic stone, weighing 500 grammes, producing laceration of the anterior wall with an extravasation of urine into the prevesical space. Chappalin collected the records of twenty-nine cases of the kind, and found that perforation took place in the anterior wall in four; in the majority it occurred in the posterior or the inferior portion of the bladder.

Many cases of idiopathic rupture associated with urinary obstruction, such as stricture or hypertrophy of the prostate gland, are reported. A case is cited by Michel and Grosse (*Anns. d. Mal. d. Org. Gen.-Urin.*, September, 1899) in which the individual had suffered for ten days from retention of urine due to stricture of the urethra. Autopsy showed a large rent

in the left lateral aspect of the bladder, which was extraperitoneal.

Bennett reports a case of extraperitoneal rupture of the bladder following aspiration for the relief of retention of the urine, and from his experience concludes that aspiration should be resorted to only in those cases in which the bladder-wall is healthy; that if the urine is affected, the bladder should be irrigated, through the aspirating needle, with an antiseptic solution before the needle is withdrawn; and, finally, if there is reason to believe that the walls of the viscus are diseased, a large trocar should be used in place of the needle. This case is really one in which a rupture followed a puncture wound of the organ, the walls being weakened from long-standing disease. So far as we know, this is the only instance of its kind on record. We have frequently found it necessary to aspirate the distended bladder, the walls of which, in many instances, were far from healthy, without meeting a complication of the kind just mentioned. Our experience is in accord with that of many other surgeons. We believe that the danger of rupture of the bladder-wall following aspiration is very slight. We cannot agree that it is safer to use a trocar in place of the aspirating needle in cases in which the walls of the bladder are diseased. We have on several occasions seen, where the trocar was used in such cases, slight extravasation of urine into the prevesical space follow removal of the instrument, setting up cellulitis. When the aspirating needle is used this danger is minimized, as on the withdrawal of the needle the little opening in the bladder-wall is apt to contract and prevent leakage of urine. It is believed that in infected cases irrigation of the bladder, through the needle, with either a weak mercury bichloride or silver solution before the instrument is withdrawn, is a wise precaution. Harrison (*loc. cit.*), commenting on the case just described, says: "I do not think such a contingency will disturb the conclusions already drawn in the favor of this method of dealing with retention in certain cases where catheterism is impracticable. That there are persons so feeble or so diseased as to be incapable of enduring

the smallest puncture wound whenever and for what purpose it is made, will be admitted. The outlook for such individuals, should they be subject to retention of urine which the practitioner cannot relieve with a catheter, is most unfavorable, whatever alternative proceeding may be substituted for the best and most natural method of emptying the bladder. I believe, in the long run, a carefully performed aspiration will be found to be most expedient under these circumstances."

An interesting case of extraperitoneal rupture of the bladder following a puncture wound from the interior of the organ came under our care a few years ago.

CASE II.—The patient was admitted to the hospital in the afternoon, suffering from retention of urine of nearly twenty-four hours' duration. The resident physician inserted, with some difficulty, a filform bougie, passed over a tunnel catheter, and withdrew the urine. Fearing that, in case the retention continued, he would have difficulty in reinserting the instrument, he decided to establish drainage by means of continuous catheterism. Finding it impossible to insert a rubber instrument, a small-sized silver catheter was passed and fastened *in situ*. We were called to see the patient in the evening of the same day and found him suffering from shock; temperature, 98° F.; pulse, 120; skin, moist and clammy; he complained of intense pain in the lower portion of the abdomen. The hypogastrium was tender, and the muscles were somewhat rigid. There was tenesmus, with the passage of a small quantity of bloody urine. Examination by rectum negative. Palpation, suprapubically, revealed slight induration, and some tenderness was detected. At first it was presumed that the shock was due to the urethral manipulation, with possible suppression of urine. In order to determine if the catheter might not, possibly, be obstructed by a blood-clot, a small quantity of hot sterilized normal salt solution was injected through the instrument into the bladder. It was then observed that the quantity of water returned was smaller than the amount injected. Rupture of the bladder was suspected. The space of Retzius was opened without disturbing the peritoneum. Immediately there was a discharge of bloody fluid having an uriniferous odor. Examination revealed a puncture wound in the upper

surface of the bladder-wall. This was enlarged, and the interior of the organ was examined and found to be normal. The stricture was dilated, a soft catherer inserted through the urethra into the bladder, and a drainage-tube placed in the suprapubic wound. The patient made an uninterrupted recovery.

On investigation it was learned that the table upon which the subject was brought from the operating room to the ward was about one and one-half feet higher than the cot; the patient being heavy and relaxed from the effects of the anæsthetic, difficulty was experienced in lifting him from the table to the bed. In doing so, the attendants accidentally let him fall a distance of about half a foot. It is presumed that at that time the beak of the catheter was thrust through the apex of the bladder. In this case a diagnosis would have been well-nigh impossible if the water test had not been made. The shock may have been due to the urethral manipulation, together with the effects of the ether. The bloody urine may have been the result of the urethral instrumentation. Tenesmus may have been due to irritation of the vesical neck. The absence of urine may readily have been due to suppression, which condition frequently attends long-standing stricture. The only suspicious and unexplainable symptoms present were the violent pain in the lower portion of the abdomen, marked suprapubic tenderness, and muscular rigidity.

The third case is one of unusual interest:

Case III.—N. A. H., twenty-four years of age; laborer by occupation. Sent to the writer by Dr. E. Wagner, of Sunbury, Pa. While employed in cutting down a tree, it unexpectedly fell, throwing him to the ground. He landed on his back, with the tree on top of him. At the time of the injury the bladder was distended with urine. The patient states that at the time of the fall he felt as if something inside of him had been torn. He immediately began to suffer great pain in the lower portion of the abdomen. There was a frequent desire to micturate, but he was able to pass only a little blood. Shock was severe. The introduction of a catheter withdrew a quantity of bloody urine.

Catheterism was necessary for several days, when the urine began to pass naturally. Within twenty-four hours after the accident a swelling appeared in the perineum, which gradually extended to the scrotum and penis, which became very much discolored. A free incision into the perineum released a large amount of bloody urine. This was followed by immediate relief. A fistulous opening, through which all the urine was passed, formed in the perineum. On admission to the hospital, seven weeks after the accident, the patient was markedly septic; pulse, 100; temperature, 103° F.; chills, followed by fever; weak and emaciated. On examination, a fistulous opening in the perineum was discovered, which passed backward *alongside of the urethra, behind the prostate gland, to the base of the bladder.* Rectal examination disclosed a thickened cicatricial mass between the bowel, bladder, and prostate. What appeared to be a fistulous opening on the floor of the viscus, a little behind the prostate gland, was discovered by means of the cystoscope. Chronic cystitis was present. At the end of a month's treatment he gained in health and strength, and returned home convalescent, except for the urinary fistula, which still persisted. Four weeks later he returned to the institution. The fistulous tract was freely laid open, packed, and drained. It gradually healed, and at the present time the patient enjoys perfect health.

A somewhat similar case is reported by Harrison (*loc. cit.*) in which the patient sustained a fracture of the ilium and rupture of the floor of the bladder, with extravasation of urine into the tissues between the rectum and the bladder, dissecting downward towards the perineum. The case was relieved by peritoneal section, but death occurred, from exhaustion, on the seventh day.

When the cardinal symptoms of rupture of the bladder are present, the patient will state that, at the time of the injury, he experienced a sensation as of something inside having burst or given way. If retention of urine has existed for a long period of time, there may be a sensation of relief, which, however, is usually of short duration, as pain generally supervenes. The pain varies in intensity: it may be very slight or

very severe; it may be located in the vicinity of the bladder, the pelvis, or be diffused over the entire abdomen. There is usually a desire to micturate, without the power to do so. In some instances the urine is passed in small quantity. A small amount of blood may ooze from the meatus, or urine passed may be tinged with blood. On the other hand, the urine drawn by means of the catheter may be perfectly clear. Shock varies in intensity, but its presence is the rule rather than the exception. In some cases the individual may be able to walk, but does so with the body bent well forward. As a rule, however, especially if the rupture is intraperitoneal, there is inability to move after the injury. If no obstruction to the urethra exists, the catheter can usually be inserted without difficulty. A small amount of bloody urine may be obtained, and in some cases, on inserting the instrument a little further, a second escape of a larger quantity may occur. It must be remembered that in rare instances the appearance of symptoms may be delayed until three or four days after the accident. In a series of 78 cases analyzed by Stephen Smith, quoted by Gross (" Practical Treatises on Diseases, Injuries and Malformation of the Urinary Bladder"), it was found that the primary symptoms were severe in 59, in 43 of which the rupture was intraperitoneal; in 9 cases in which the peritoneum was involved *the symptoms were slight; in 3 they were absent.* Twenty-eight had retention of urine; in 3 the bladder retained its propulsive power; there was bloody urine in 25; clear, in 4. In only a few was there any evidence of external injury. Seven were able to walk after the injury, and 7 experienced a sensation as of something giving away when the rupture took place.

It is important to observe, from a medicolegal standpoint, that a severe laceration of the walls of either a contracted or a distended bladder may occur without there being any evidence of external injury. It should be an invariable rule to examine the condition of the bladder in all cases of fracture of the bony structure of the pelvis, or in those cases in which the patient is under the influence of liquor or insensible from

any other cause. Two cases of pelvic injury are cited by Harrison that were admitted to the hospital with rupture of the bladder, without symptoms, where an examination resulted in the diagnosis being made. The reports of cases of rupture of the bladder with delayed symptoms are sufficiently common to warn the surgeon to be always on his guard in dealing with pelvic injuries. Bloomer records a case (*British Medical Journal*, December 22, 1900) of a man who fell, while under the influence of liquor, striking the abdomen. Four days later, in spite of the fact that he had suffered from retention of the urine since the accident, he walked to the hospital, a distance of two miles. The abdomen was enormously distended. The catheter withdrew 196 ounces of bloody urine, after which the distention disappeared. Celiotomy was performed, and a rent was discovered in the posterior wall of the bladder, large enough to admit two fingers. Holmes saw a case ("Principles and Practice of Surgery") in which the man walked to the hospital thirty-six hours after the injury. The autopsy revealed an extensive laceration of the organ. In both of these cases the rupture was intraperitoneal.

A case is reported by Daley and Harrison (*British Medical Journal*, 1903) where, if the patient had been seen directly after the accident, diagnosis would have been extremely difficult, if not impossible. Definite symptoms did not make their appearance until three days after the injury. Operation was performed sixty-four hours after the accident. A rent in the posterior wall of the bladder was discovered and closed by means of sutures. The patient recovered.

A study of the irregular symptoms that may attend rupture of the bladder must impress the observer with the fact that a diagnosis of this injury is by no means always an easy matter. If the essential symptoms are present in conjunction with the history of the accident, it should not be difficult to arrive at a definite conclusion as to the character of the injury that the bladder has sustained. The likelihood of error becomes manifest when we take into consideration that an individual with a ruptured bladder may or may not be able to walk.

Shock may be present or absent. The patient may be able to expel the urine; on the other hand, micturition may be attended with difficulty or there may even be absolute retention. A slight amount of blood may dribble from the meatus, or there may be no sign of hæmorrhage. The urine, either passed naturally or obtained by means of a catheter, may be clear or bloody. Catheterization may result in the withdrawal of a large or of a small quantity of urine. The pain may be slight or severe. Finally, symptoms referable to the bladder may be delayed for several days after the accident; the development of peritonitis usually being the first indication as to what has occurred.

When we consider that the safety of the patient depends on an early recognition of the condition, with prompt surgical interference, it becomes apparent at once how essential it is to diagnose the injury with as little delay as possible.

Fortunately, in the majority of instances a history of injury to either the abdominal or the pelvic organs can be obtained; this, taken in conjunction with the urinary symptoms usually present, renders the diagnosis of rupture of the bladder an easy one to make. We agree with Alexander that valuable time should not be lost in attempting to make a differential diagnosis between an intraperitoneal and an extraperitoneal laceration. If it is certain that a rupture exists, operation should be proceeded with as soon as the patient can be prepared for the ordeal; trusting to an exploratory incision to reveal the exact nature of the injury, and dealing with it according to the indications.

In cases of extraperitoneal rupture, local symptoms may be present that will indicate the nature of the injury that the bladder has sustained. If the rent has taken place in the apex of the bladder, with an extravasation of urine into the prevesical space, the local symptoms will depend on the size of the wound in the organ. If the opening is small, the extravasation into the space of Retzius takes place slowly, and resembles, on palpation, an infiltrating mass. Should the tear be extensive, the urine escapes rapidly, flows beneath the peritoneum, and,

according to Gross (" System of Surgery," vol. ii, edition 6), " may extend as high as the umbilicus and kidneys, or as low down as the thigh, and passing through the obturator foramen." In either case there are usually rigidity of the recti muscles and tenderness on pressure in the region of the bladder. Guyon states that an extensive extravasation may stimulate a greatly overdistended bladder.

A case of intraperitoneal rupture is reported by Thomas G. Morton in which the extravasation of urine was largely into the muscular interspace of the abdominal walls, very little urine being found in the peritoneal cavity. A case of this description would render diagnosis impossible without the aid of an exploratory operation, and is certainly an argument against losing valuable time by attempting to diagnose the character of the injury without its aid.

As has already been pointed out in citing Case III, where the rent involved the base and neck of the bladder, the injury being extraperitoneal, the urine burrows forward towards the perineum and scrotum, simulating a rupture of the membranous portion of the urethra. Gross, speaking of spontaneous rupture from overdistention, states that, " The mucous and muscular coats generally give way posteriorly; in which the urine accumulates under the peritoneum as a kind of subsidiary pouch." Such cases, seen early, before extensive infiltration of urine has taken place, the diagnosis as to just what portion of the bladder-wall has been torn may be difficult, if not impossible, to make. Should, however, suprapubic and rectal palpation elicit undue tenderness in the vicinity of the neck of the bladder, together with unmistakable symptoms of rupture, there would be good reason for suspecting that the injury sustained was located at the base of the organ, and was probably extraperitoneal.

In those rare instances in which the mucous coat alone is torn, the only symptoms present will probably be pain, hæmaturia, frequent desire for micturition, and possibly only partial ability to expel the contents of the bladder. The only manner in which a diagnosis can be arrived at in a case of this descrip-

tion is by means of a suprapubic cystotomy. Where the mucous coat alone is torn, recovery may follow continuous catheterism; drainage being continued for at least two weeks, but as there are no certain means of diagnosing an injury of the kind, operation must be resorted to. The employment of a sterilized silver catheter for the purpose of diagnosis is probably attended with a minimum amount of danger of spreading the infection. It should be resorted to only, however, in doubtful cases. The use of the instrument, in spite of every precaution, may give rise to sepsis, and there is always the fear that an incomplete may be changed to a complete rupture, with attendant danger from extravasation of urine.

In our opinion the cystoscope should never be employed, as there is no means of telling whether the rupture is intraperitoneal or extraperitoneal. In order to use the instrument, the damaged bladder must be distended by means of either air or water, which has a tendency to increase the danger of infection if the peritoneum is involved.

Some writers advocate injecting filtered air into the viscus by means of a sterilized Davidson syringe around the nozzle of which cotton has been fastened. This method is strongly condemned at the present day. Walsham tried this test in two cases, collapse following in one instance; this condition, however, was relieved as soon as the abdominal cavity was opened. (*Trans. Med.-Chir. Soc.*, vol. lxxxiii.)

When the air test is made, if the bladder-walls are intact, the organ will become distended above the pubis, the air escaping through the catheter. In cases of extraperitoneal rupture, emphysema of the cellular tissue in the vicinity of either the rectum or the prevesical space will occur, depending on the situation of the laceration. If the rent is intraperitoneal, the air escapes into the general peritoneal cavity, and, according to Walsham, the liver dulness is lost. It is in this class of cases that collapse is likely to follow the experiment. If there is intestinal distention, this test is unreliable.

The injection test, suggested by R. F. Weir (*New York Medical Record*, January 22, 1887), consists in distending the

rectum by inserting a Peterson's rubber bag, which is filled with seven ounces of water; the bladder is then injected with a known volume of fluid. Should a marked pelvic tumor appear above the pubis, this must be due either to a distended bladder or to extravasation from an extraperitoneal rupture. Failure to recover all the fluid injected, by means of the catheter, would indicate an intraperitoneal rupture. Should there be no dulness on suprapubic percussion and only a portion of the fluid injected be recovered, the rectal bag should be withdrawn and a digital examination of the bowel made; if there is a postero-inferior subperitoneal rupture, it can readily be detected, for if the tear is intraperitoneal, no infiltration will be found, and the same quantity of fluid injected will be recovered.

In articles that have appeared recently on "Rupture of the Bladder," by Alexander and Jones (*loc. cit.*), both the infiltration of air and the injection of water tests are, in our opinion, very justly condemned. The infiltration test adds considerably to the shock and pain so frequently present; it lowers the individual's resisting power, and, as has already been pointed out, is not free from the danger of giving rise to collapse. It has a tendency to spread the infection throughout the peritoneal cavity and thus give rise to general peritonitis.

The injection test may fail to give reliable results in the face of a rupture of the vesical walls, owing to the fact that the opening may be very small, permitting a leakage of a small quantity of urine, the consequence of which may be very grave; yet when distended with air or water, fail to give positive results. The laceration may be valve-like in character, thus retaining air or water when distended, but permitting a leakage when in the state of contraction. White and Martin state ("Genito-Urinary and Venereal Diseases"): "The injection of an antiseptic solution is by no means an infallible test, since even an extensive rupture may so quickly close by inflammatory adhesions that a solution injected with gentle pressure fails to break this down, and the total quantity is at once returned."

Alexander cites two cases where both the infiltration and the injection failed to demonstrate the pressure of a rupture;

yet in both instances an extensive laceration was discovered,—one at the time of operation, the other at the autopsy.

It must not be forgotten that rupture of the bladder may exist without manifesting any characteristic symptoms. A contusion of the abdominal wall may give rise to subjective symptoms exactly similar to those produced by rupture of the vesical walls, even to the appearance of blood in the urine.

From what has been stated it is evident that there is no known means at our disposal that can be regarded as a reliable aid in attempting to diagnose rupture of the bladder. Attention is called to the fact that all the expedients suggested are fraught with more or less danger to the patient; the use of a sterilized catheter is probably less dangerous than any of the other expedients. It follows, therefore, that in all cases of doubt, instead of losing valuable time by employing measures that are frequently unreliable in a large number of cases, and that also add greatly to the danger to the patient, it is wiser to proceed at once with an exploratory operation, the treatment depending on the character of the injury that is found to exist. On several occasions we have found it necessary to make a differential diagnosis between suppression of the urine and spontaneous rupture of the bladder. The difficulty is enhanced if the patient is unconscious from alcoholism or injury. In cases of suppression of urine, if the patients are conscious, there is neither tenesmus nor abdominal or pelvic pain. A few drops of urine may pass, but a free stream never escapes. Blood is absent. By the insertion of a catheter a small amount of cloudy urine is usually withdrawn, an examination of which will show the presence of albumin and probably of casts. In cases of this description, if palpation suprapubically and by rectum is negative, the case should be regarded as one of suppression of urine due to some kidney complication. In doubtful cases the injection test, followed by the employment of the cystoscope, will be justifiable, the surgeon being prepared to operate immediately if a rupture is found to exist. Treatment may be summed up in a few words: operate in every case with as little delay as possible.

It is true that a few cases are recorded in which a rupture

of the bladder had taken place, and the individual recovered as the result of continuous catheterism. Notably, are those reported by Henry Morris, Greig Smith, Benham, and Thorp. The case of Benham and Smith was that of an imbecile who pushed an umbrella whalebone up the urethra into the bladder. Two years later he died of Bright's disease, and at the autopsy the whalebone was found, encrusted with phosphates, partly in the bladder and partly in the peritoneal cavity. At no time had there been any symptoms referable to the bladder or the peritoneum. In view of what has been accomplished by aseptic surgery in the past few years in lessening the shocking mortality of this severe injury, at the present day no progressive surgeon would be willing to depend on continuous catheterism as a method of treatment in cases of rupture of the bladder.

The literature on this subject shows that occasionally a rupture of the bladder may exist with either an absence or a delay of any symptoms that would lead the surgeon to suspect that the organ had been injured. Such cases finally develop peritonitis or die either from toxæmia or from septicæmia.

It has long been known that normal urine in a healthy bladder is sterile; when, however, it is confined in the peritoneal cavity, it is gradually absorbed and has a toxic influence on the blood; or it may undergo decomposition, giving rise to peritonitis. It has frequently been observed that in a wound of the bladder occurring accidentally during an abdominal operation, the urine extravasating into the peritoneal cavity, no deleterious results may be apprehended, provided the urine is sterile, the peritoneal cavity well irrigated, and an egress provided for its escape.

The experiments of Menzels (*Wiener med. Woch.*, Nos. 81, 85, 1869) prove conclusively that sterile urine in the peritoneal cavity is harmless so long as a free escape is provided for it. Keyes (Van Buren and Keyes, "Diseases of the Genito-Urinary Organs," 1874) found that *subcutaneous injections of fresh healthy urine* were followed by no signs of irritation.

The condition is quite different when the urine is loaded

with micro-organisms coming from an injected bladder. In such cases the extravasated urine is frequently mixed with blood, which, coming in contact with tissues whose resisting powers have been lowered by injury, and being confined in the structures without a vent for its escape, it rapidly undergoes decomposition, giving rise to wide-spread destructive inflammation, frequently associated with a grave form of septicæmia. The urinæmia which sometimes attends such cases is believed by Coates to be due to the fact that the urea is no longer eliminated from the system.

In cases of extraperitoneal rupture involving the base of the bladder the symptoms simulate those of rupture of the membranous urthra. In cases similar to Case III, cited by us in this paper, the best method of operating in order to give relief is to employ the technique that is suggested by Fuller for extirpation and drainage of the seminal vesicles. (*Journal of the American Medical Association*, May 4, 1891.) This operation has the advantage of freely exposing the base of the bladder. Should doubt exist as to whether or not the laceration involves the peritoneum, suprapubic cystotomy should be performed and the viscus explored. If it is then discovered that the tear extends into the peritoneal cavity, the abdomen should be opened and the wound in the bladder closed in the usual manner. In cases of extraperitoneal rupture with extravasation into the space of Retzius, the bladder should be opened suprapubically, the cavity of the organ explored, and if it is found that the laceration does not involve the peritoneum, the bladder should be drained as in the ordinary suprapubic cystotomy. When an intraperitoneal rupture is suspected, the prevesical space should be opened and the bladder incised; any clots that it may contain should be washed away, and a search be made to determine the position and character of the rent. As soon as the nature of the injury has been detected, the abdominal cavity should be opened, the patient placed in the Trendelenburg position, the intestines walled off by means of sterilized gauze, and the wound in the bladder-wall closed by means of sutures.

There are several questions regarding the technique of closing wounds of the bladder that are still unsettled. It is generally conceded that the wound is best closed with fine silk, as the catgut sutures cannot be depended upon to endure for a sufficient length of time. Several cases have been reported in which this latter material was employed, where a leakage occurred, owing to the too rapid absorption of the suture, death resulting from peritonitis. Only the muscular and serous coats are brought into apposition; two layers of sutures are employed for this purpose, the muscular layer being closed by the interrupted Lembert suture, and the serous by the mattress suture. An excellent suggestion was made by Alexander,—that of putting an additional interrupted suture a little beyond each angle of the wound, this having a tendency to render it additionally safe. The consensus of opinion is averse to distending the bladder after the wound has been sutured, in order to determine whether or not the wound is water-tight. It is believed that this is apt to tear out the sutures and may result in leakage. Moreover, in closing wounds of the intestines no such test is made in order to determine whether or not the approximation is accurate, and it would seem that the same law holds good in similar bladder injuries.

It is a moot point whether it is best to close the abdominal wall without suprapubic drainage of the bladder or establish suprapubic drainage and leave the abdominal cavity partially open, walling off the intestines by means of sterilized gauze. It is beyond question that the first is the ideal method to pursue; nevertheless in some instances where this plan has been adopted leakage of the wound in the bladder has taken place, and, there being no egress provided for the escape of urine, death has resulted from peritonitis. In these cases, if abdominal drainage had been provided, life would probably have been saved. In each instance the surgeon must rely on his judgment and experience. In view of the clinical experience of others, however, we are of the opinion that it is wisest to establish suprapubic drainage of the bladder, leaving the abdominal wound partially open, the intestines being protected by means of sterilized gauze.

Many writers speak of the difficulty often encountered in attempting to close a rent that is located posteriorly and towards the base of the bladder, being situated at a great depth in the pelvis. In a case of this description Alexander speaks highly of the employment of Smith's rectangular cleft-palate needle-holder, employing a small curved Richard's needle, was found to be of great value. The complete closure of the lower angle of the rent deeply seated is not only the most trying part of the operation, but a failure to approximate the edges of the wound completely has in several instances resulted in leakage, with death of the patient. Any expedient that has proved of service in such cases is worth recounting. The method adopted by Jones (ANNALS OF SURGERY, February, 1903) seems to be very feasible. He states that "The difficulty of suturing the lower end of the wound can be obviated largely by putting the patient in the Trendelenburg posture, by leaving the ends of each successive suture long, and by beginning to suture at the upper end of the wound. By this means the wound is pulled up within easy reach, and each suture below can be placed without difficulty. A round, full-curved needle in a needle-holder with a long handle which can be held by the fingers instead of the whole hand, that is, an elongated hæmostatic forceps with short powerful jaws, makes the suture a comparatively easy one." Cases in which the rupture is partly extraperitoneal and partly intraperitoneal should be treated on the same principle as an intraperitoneal rupture. In some instances the rent in the bladder-wall cannot be located even by an exploratory incision. Of six cases of rupture of the bladder reported by Thorndike (*Journal of Cutaneous and Genito-Urinary Diseases*, May, 1899), in two the openings in the bladder were not found; the wound was drained; both patients recovered. A number of similar cases on record. This only serves to demonstrate the truth of the statement that the danger of extravasation of urine in the peritoneal cavity is minimized by irrigation, free drainage, and by not allowing the urine to accumulate in the tissues.

The prognosis will vary with the character of the injury and the complications that may be present. It is rendered more

favorable by early diagnosis and immediate operation. In those cases in which the symptoms are delayed or are in abeyance, the outlook is usually grave. Previous to 1882 intraperitoneal rupture was regarded as a fatal injury. Gross, writing on this subject, says: "Rupture of the bladder is nearly always fatal." Of 166 cases collated and analyzed by Dr. Max Bartels in 1882, 149 died and 17 recovered. Dr. D. F. Jones, analyzing 54 cases in 1903, found that there were 26 deaths and 28 recoveries, that is, a death-rate of 48 per cent. Taking, however, 22 of the cases published since 1892, there were 15 recoveries, giving a mortality of 27.5 per cent. Nothing more is needed in order to vindicate the claim made in this paper that the recovery of cases of rupture of the bladder depends on an early diagnosis and prompt operation.

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INTRAPERITONEAL RUPTURE OF THE URINARY BLADDER.[1]

RECOVERY AFTER LAPAROTOMY AND BLADDER SUTURE.

BY JOHN R. COOK, M.D.,
OF FAIRMONT, WEST VIRGINIA.

An adult man, a Slav, was brought to my hospital October 17, 1904; pulse rapid and thready; abdomen distended and dull on percussion; from the pubis to the umbilicus with a pinched expression and all symptoms of collapse. On account of his inability to speak English, I could get little or no history from him except that of falling eighteen feet from a window fifty hours previous to his admission. He was catheterized and a few ounces of urine obtained. He was at once taken to the operating-room and, after the necessary preparations, his abdomen was opened. I found the belly cavity full of urine; the amount could not be measured accurately, but it was certainly more than a gallon. This was mopped out rapidly; the bladder, when pulled up into view, showed a rent two and one-half inches long transversely, which was closed with two rows of heavy catgut continued suture, being careful to avoid the mucous membrane as each suture was placed. Heavy catgut was used because the man was so badly shocked that it was important that the sutures should not break. After irrigating with five gallons of normal salt solution, a wick of gauze was left in for drainage through the abdominal wall.

Four hours after the operation the patient voided urine naturally, and went on to a rapid and complete recovery. He was discharged in five weeks. The only reason suggested for the large quantity of urine in so many hours is the probability that the man had been drinking beer, which had caused a greatly distended bladder at the time of his fall.

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[1] Reported to the Medical Association of Western Virginia, May, 1905.

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THE RÖNTGEN METHOD IN LITHIASIS OF THE URINARY TRACT.

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It is one of the strange phenomena in medicine that, in the face of the most abundant proofs of the reliability of renal skiagraphy, some of the best text-books still hesitate to recommend the method, some others even openly warn the practitioner against it. This they do because they have observed or heard of grave errors committed in its employment. Thus it is said, for instance, that skiagraphs taken by the "best experts" have shown renal calculi, while nephrotomy disclosed the absence of any concretion; and on the other hand that cases were reported in which calculi were found at the operation after skiagraphy had failed to show their presence. None of these reports are well founded.

Whatever errors have been committed were of the individual, not of the method; and this should not be held responsible. I have often had to admire the power of imagination of some novices in skiagraphic work, who demonstrated the outlines of calculi as well as of some abdominal organs to me, when I could only find the indications of a dense band of tissue, or a spot in the plate, or a button of the underclothing of a too modest patient. Such visionary powers, while immensely useful in the art of Shakespeare or Goethe, cannot be too strongly reprehended in the domain of science and in the field of the Röntgen rays.

But now, fortunately, skiagraphic technique is so much advanced that it stands in no need of the imagination. A definite diagnosis in suspected lithiasis can be made in each and every instance; in other words, a renal calculus must invariably show, provided a calculus is there.

Lumbar exploration and similar procedures for suspected nephrolithiasis, advised in all text-books, are therefore no longer in order. The Röntgen method not only answers the question, Are calculi present? but gives precise information as to their size, shape, and number. It will also show whether there are any calculi in the ureter or the bladder.

The revolution which the Röntgen method has wrought in this special field is indeed as great as in that of the injuries and diseases of the bones, which after years of struggling, thanks to the untiring efforts of a few imperturbable physicians, is gradually beginning to be appreciated by the profession at large.

The chemical composition of the calculi of the urinary tract determines the greater or lesser depth of their shadows. The greater their atomic weight, the greater their density, and consequently the more distinct the shadow. Thus, calculi composed of oxalate of lime show the most distinct shadows. (See illustrations.) Their shadows are even deeper than those of bone-tissue. Next to them we find those consisting of phosphate of lime, while the uric acid calculi give the faintest shadows.

In practice, however, we often find that calculi are not of one distinct type, and if they are, layers of various degrees of density are observed. Two strata are generally present, then one or the other character predominating. So it will frequently happen that there is a nucleus of uric acid surrounded by alternate layers of the other elements.

This explains why at least some dense areas are struck in all cases of renal calculus. The same is true when the calculi are of small size, like the one, for instance, illustrated in Fig. 1, *C*. But the question of composition is of less importance than that of bringing the calculous area as near to the photographic plate as possible, and keeping the field absolutely quiet.

These two requirements are attained by the use of a tubular diaphragm, which offers another great advantage, that of permitting the passage of the focal rays alone, thus exclud-

ing the vagabonding rays,—viz., those emanating from the tubal wall. (See illustration in "Recent Advances in Röntgen-Ray Diagnosis," *Archives of the Röntgen Ray, etc.*, London, February, 1905.) The disadvantage of the tubular diaphragms is that only small areas can be shown at a time. This disadvantage is little felt in the representation of joints, etc., but in renal or biliary skiagraphy it may be responsible for missing the seat of the calculi.

It is evident, therefore, that in skiagraphy of the urinary tract a general exposure must precede that of a limited area, since it cannot be known beforehand whether the suspected calculi are situated in the ureters or in one or both of the kidneys. In other words, the Röntgen plate must *a priori* include an area bounded by the eleventh rib and the crest of the ilium on one side and by the vertebræ and the anterior axillary line on the other. For this purpose, plates of the size 10-12 or even 11-14 inches are required. Corresponding with each side of the body wire letters are placed. These serve as landmarks for comparison, and at the same time indicate the sides of the body. (Letters R and L.) This is emphasized for the reason that cases are reported in which it has happened that on account of the inverted relations of the negative the wrong side has been incised. In Fig. 1, for instance, which was taken in the abdominal position, the bones are so distinct that an inexperienced eye might take it for a dorsal view, which, of course, would transpose the sides from right to left.

A few more wire letters may be placed in the renal region, to serve as landmarks for the special exposure also. It is useful sometimes to attach the same wire letters to the body by means of adhesive plaster strips, and to skiagraph them together with the wire letters on the plate. We are thus able to compare the relations of the landmarks of body and plate for better localization.

Now, while with the general tentative exposure only faint outlines of the calculi are obtained, as a rule, they may be distinct enough to show at what area the diaphragm should be adjusted to attain the most distinct outlines.

If the large plate proves to be negative, although other means of examination point to the presence of nephrolithiasis (hæmaturia for instance), both renal regions must be separately examined with the aid of the diaphragm, several exposures sometimes being required. This is, of course, troublesome, but, in view of the great importance of a correct diagnosis, it cannot be omitted. Rarely, however, does it happen that many exposures are needed. Two, as a rule, suffice for our information. In this manner I have also been able to show the indications of calcareous deposits produced by renal tuberculosis.

So the *modus operandi* in renal skiagraphy is the following:

The general exposure is preceded by a thorough evacuation of the bowels, followed by the administration of a moderate dose of opium. The patient is in the dorsal position on a large plate covering both lumbar regions. For localization, a few wire letters are distributed over the plate, the R (right side) and L (left side) being placed directly underneath the outer surfaces of the lumbar regions, so that they appear on the integumental margins of the skiagraph. With a pair of calipers their distances from the spinal column and the ribs are ascertained and transferred upon the abdominal surface to be marked there for the proper adjustment of the diaphragm. Head and shoulder are elevated by a few pillows, while the chin touches the sternum. The knees after being flexed are well immobilized by sand-bags. The exposure should last from three to five minutes, according to the thickness of the abdominal tissues to be penetrated. The vacuum of the tube should be soft. I prefer the self-regulating tube of Müller for renal skiagraphy.

The criterion of a good plate is, that the vertebræ, the eleventh and twelfth ribs, and the outlines of the ileopsoas muscle shall be clearly defined. On the other hand, a plate which shows a number of calculus-like shadows, but fails to represent these points, must be regarded as misleading, and should never be used as a guide for operation. The only thing

to do is to try a second and, if necessary, a third or fourth time; the latter, however, seldom being necessary in the hands of a man of some experience.

If the plate is good, and shows the indications of calculi, the tubular diaphragm is now to be applied in the same position as advised for the general exposure, with the difference that the shoulder of the exposed side is elevated somewhat more. It is best pushed below the rib arch in an oblique direction in such a manner that its centre corresponds with the landmarks indicated on the large plate. The oblique direction permits the diaphragm to be pressed deeply into the abdomen, thus reducing the distance between it and the plate to a considerable extent.

The time of diaphragmatic exposure should be two minutes in thin and from four to five in stout individuals.

If the large plate be negative, I resort to a diaphragmatic exposure, nevertheless; and if this shows distinctly the criteria mentioned above, I can positively assure my patient that he does not suffer from nephrolithiasis. (See Fig. 2, left side.)

It is not desirable, however, that the bones mentioned should show textural details. As a rule, the longer the exposure lasts, the clearer the bones show, and the less marked will the calculi appear. Fig. 4, *a*, for instance, represents the result as it should be, while Fig. 2 is over-exposed. Of course, the calculi still show sufficiently clear, but it is characteristic enough that Fig. 1, which is taken without the diaphragm and in the less favorable abdominal position, shows the renal calculi even more distinctly than the diaphragmatic exposure.

From this we also learn that general rules only for the time of exposure can be laid down, the instinct of the more or less experienced operator being an important factor in determining details.

These views apply even more closely to the technique of biliary skiagraphy. As I have often insisted, the reason why so many surgeons have tried in vain to represent biliary calculi is due to the simple fact that they use hard tubes, which penetrate the calculi, so that they, on account of their general

degree of density, are irradiated away, so to speak. In all my successful exposures for biliary calculi the bones appear dark and especially show no textural details.

The principles of renal skiagraphy also apply to that of the urinary bladder. Vesical calculi can, however, be well shown without the aid of the diaphragm (Fig. 1). In stout individuals the diaphragm may sometimes be useful.

The patient is skiagraphed in the recumbent position, the centre of the tube to be directed to the upper margin of the symphysis. The criterion of a good vesical skiagraph is that it well shows the structures of the coccyx. The sacrum should not show any details. By oblique irradiation the shadows of vesical calculi are generally found just below those of the coccyx. An oblique exposure should also be made, because it may show whether the stone is free or encysted. If the patient bend slightly forward in the lateral position, the calculus, if free, sinks towards the anterior vesical wall and becomes conspicuous directly behind the anterior or abdominal wall. If it is not free, it usually shows far back towards the sacrum, since encysted calculi are nearly always attached to the posterior vesical wall. If the stone be of very large size, or if a great number of stones be present, the whole vesical space is filled up, and displacement is not apt to occur.

As far as the diagnosis of the number, shape, and position of the calculi is concerned, the Röntgen method affords more valuable aid than the cystoscope, aside from the fact that a calculus embedded in a diverticulum will escape the cystoscope, while the rays will always detect it. At the same time it should be realized that skiagraphy is a far more comfortable procedure than cystoscopy. The time of exposure is two minutes in children and three to four in adults. A soft vacuum is just as desirable as in renal skiagraphy.

My experience with the Röntgen method has suggested that it is necessary always to skiagraph the renal regions at the same time whenever vesical calculus is suspected. Since I have made this a principle, I have found renal calculus whenever there was a concretion in the bladder. This is not

strange, if we realize that most vesical calculi were originally formed in the kidneys. It also explains the frequent recurrence of vesical calculus after operation. Within the last year I have studied three cases in which I operated for recurrent vesical calculus. In all of them skiagraphy revealed the presence of nephrolithiasis.

The first case was that of a woman of thirty-two years, who submitted to lithotripsy a year before I saw her. She was greatly relieved at first, but nine months afterwards she began to suffer from frequent micturition and pain in the vesical region. Skiagraphy demonstrated the presence of a small calculus in the bladder and a larger one in the renal region. I removed the vesical calculus (St. Mark's Hospital), but the patient has since felt so well that she has not concluded to be operated upon for the nephrolithiasis. If the size of the renal calculi is such that they pass the water I do not regard the removal of the renal calculus as an imperative necessity, but advise antilithiatic medical treatment first, the effect of which is studied by the Röntgen method.

Another case, a man of twenty-four years, showed the same history. Suprapubic lithotomy two years before I saw the patient had brought complete relief, the symptoms of recurrence appearing a year afterwards. Skiagraphy revealed a vesical calculus of moderate size and a triangular calculus of large size in the left kidney. The patient submitted to suprapubic lithotomy (St. Mark's Hospital), and so far has not returned to me for interference in the renal region.

The third case is that of a boy of seven years, from whom a large vesical calculus was removed by suprapubic cystotomy three years ago. The relief was complete for about a year when patient again began to suffer from the symptoms of vesical calculus. The parents were at first unwilling to permit of repeated surgical interference, and while hesitating, the patient became thoroughly emaciated. Symptoms of light urosepsis finally constrained the parents to give up their resistance. The general skiagraph (Fig. 1, *a*,) revealed the presence of vesical as well as of renal calculus on the left side. Suprapubic cystotomy was performed at the Post-graduate Hospital, which brought immediate relief from pain and micturition, but had little effect on the

FIG. 1.

a

GENERAL SKIAGRAPH OF RENAL AND VESICAL CALCULI (ABDOMINAL POSITION)

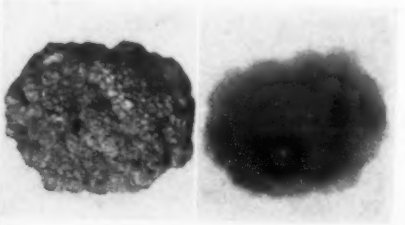
b

d

PHOTOGRAPH SKIAGRAPH
OF
RENAL CALCULI

c

e



PHOTOGRAPH SKIAGRAPH
OF
VESICAL CALCULUS

LEFT. FIG. 2. RIGHT.

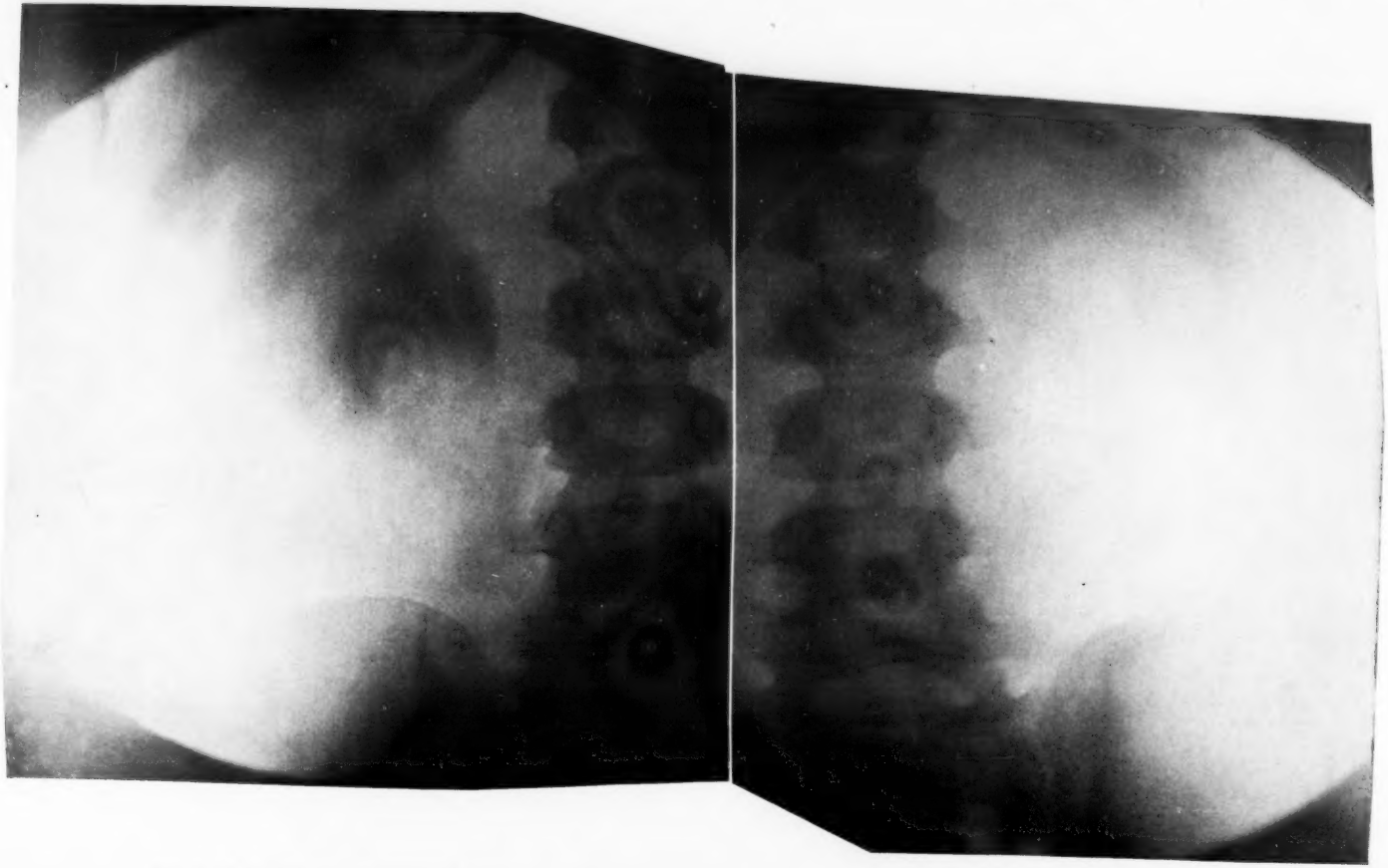


FIG. 2. POSTERIOR DIAPHRAGMATIC EXPOSURE, SHOWING CALCULI ON THE RIGHT AND NORMAL CONDITIONS ON THE LEFT

pyelitic symptoms. The extreme exhaustion of the patient seemed to me a contraindication to immediate nephrotomy, and I tried to keep the patient up by stimulation, at the same time giving urotropin internally. Three weeks afterwards, when the vesical wound was thoroughly healed, I resorted to nephrotomy. The large triangular calculus was tightly embedded in the parenchyma, so that it had to be mostly shelled out with the knife. (Fig. 1, *b* and *d*.) The patient was discharged from the hospital four weeks afterwards. Fig. 1, *c* and *e*, shows the calculi after removal. It is interesting to note the small calculus which was found near the lower surface of the large renal concretion. If not removed, it would most probably have formed the nucleus for a third calculous formation in the bladder; Fig. 1 (*d* and *e*) shows the calculi skiagraphed after removal in order to demonstrate their density. The vesical as well as the renal calculus consists of oxalate of lime and the outer layer shows a smaller degree of density than the inner.

Another case of great skiagraphic interest was operated on at the Post-graduate Hospital on the same day. It was that of a lady of thirty-six years, who thirteen years ago began to suffer from violent pain in the right lumbar region. Examination of the urine revealed the presence of pus. Nephrotomy disclosed a calculus of moderate size surrounded by pus. It was supposed then that the calculus was the source of the suppuration, and consequently a speedy recovery was expected. This expectation did not become realized, a fistula remaining. The patient improved considerably, but the fistula did not close; so that after the lapse of a year nephrectomy was advised. To this the patient would not submit, as her general condition had meantime become very good, and the discharge had decreased.

About a year later the fistulous tract closed; more pus appeared in the urine and the left side became painful. Left-sided nephrotomy was now done, and a large abscess evacuated. The patient improved again and the opening closed, but the pyuria continued, the patient's condition varying considerably.

When I saw her for the first time, I suggested skiagraphic examination in addition to the other modern diagnostic means, cryoscopy, ureteroscopy; but the patient said, "There is no necessity for examining for nephrolithiasis, because 'the' stone was removed by the surgeon." I mention this as an interesting

instance of misleading argument. I, of course, insisted upon my proposition. The result is shown in Fig. 3, which reveals the faint outlines of calculi in the right lumbar region. Fig. 4, obtained by the aid of the diaphragm, shows the calculi well marked. It was taken in the slightly oblique direction, the diaphragm being pressed inwardly underneath the rib-arch. The criteria of a good skiagraph—viz., the last rib, the vertebræ, and the ileopsoas muscle—are well marked. The ilium is also, of course, conspicuous. Fig. 4, *b*, shows the calculi, which consisted of oxalate of lime, after their removal, while Fig. 4, *c*, indicates their degree of translucency. In all of them two layers of different density are noticeable.

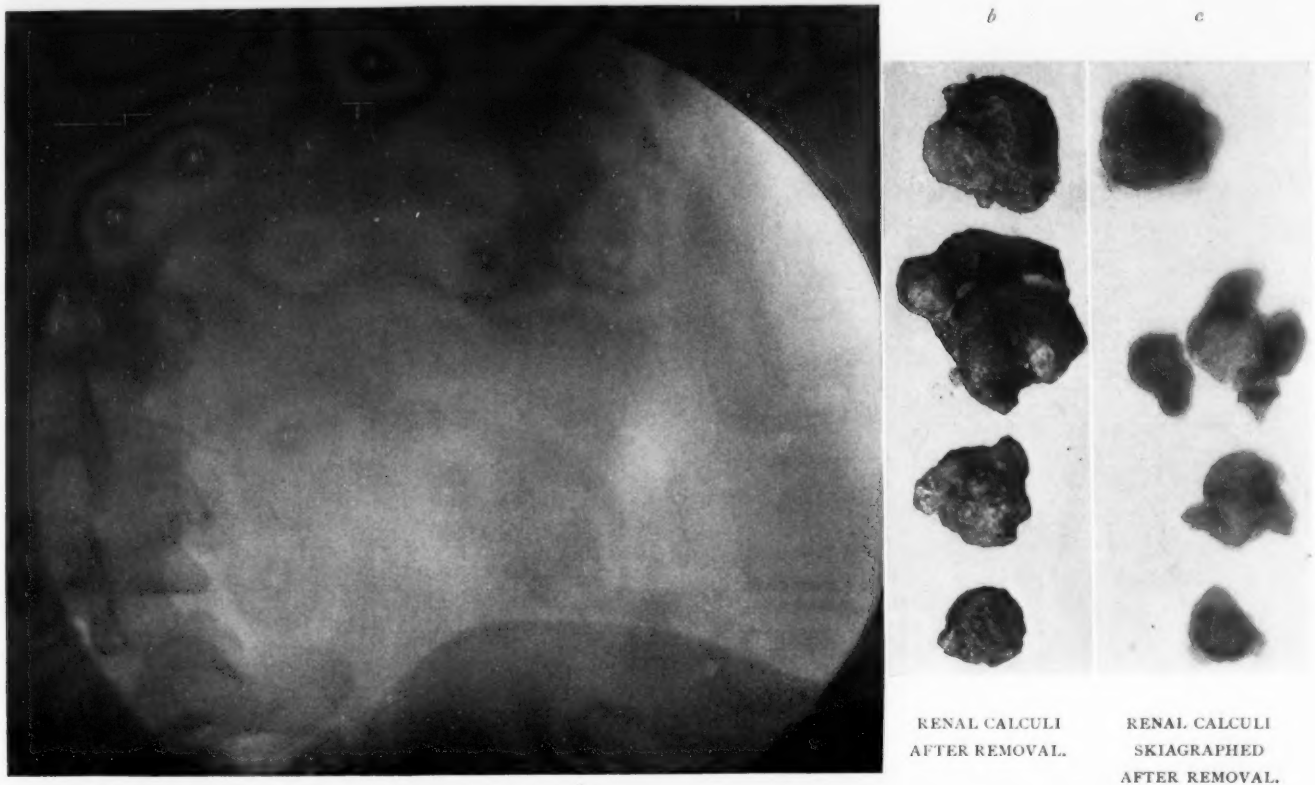
The calculi had to be shelled out, not without difficulty, the irregular surface forming an impediment. The perirenal structures were matted and hardened, a natural consequence of the long-standing suppuration and inflammation. The adhesion was so dense that the kidney could not be lifted out, and great care had to be exercised during the whole procedure. (This is another point against the formation of normal blood circulation after decapsulation.) The third stone from above had a sharp triangular edge. Recovery took place in two weeks, the patient then being able to go round. Three weeks after the operation, febrile elevations began, and the left side became painful. An abscess formed, which was promptly discharged. Exploration of the abscess-cavity revealed the presence of a long sinus leading to the opposite side just in front of the spinal column. The patient improved slowly, and is up at the present writing, the thorough closing of the wound being expected in a short time.

The epicrisis of this case suggests that nephrolithiasis existed at the time of the first operation, when the Röntgen method was unfortunately not yet available. The very able surgeon who operated at that time undoubtedly examined the kidney carefully, but was unable to palpate the calculi through the parenchyma. The advice given later, when the fistula did not close, suggests that he thought the kidney to be in a state of destruction, rather than assumed the presence of any more than "the" stone, which would under the circumstances have been most natural. Under the most careful wound treatment and the good care of the intelligent patient, the fistula closed, but the pus was retained in the depth, and probably found a way to the opposite side, necessitating

FIG. 3.

GENERAL SKIAGRAPH OF RENAL REGION, SHOWING FOUR CALCULI ON THE LEFT SIDE.

FIG. 4.



a

RENAL CALCULI (SEE FIG. 3), TAKEN WITH THE AID OF THE AUTHOR'S DIAPHRAGM.

b

RENAL CALCULI AFTER REMOVAL.

c

RENAL CALCULI SKIAGRAPHED AFTER REMOVAL.

the incision on the left side. It is evident, that if the Röntgen method had been available at the time of the first operation, the remaining calculus, which penetrated the whole kidney, so to say, would have been recognized and removed at once, thus sparing years of suffering.

Skiagraph No. 4 not only shows the number of the renal calculi, their size and their shape, but also localizes them. After the surgeon has removed the four calculi, which can be identified with those of the plate, no further searching is required, while in case there is only a faint reproduction the kidney must be nearly bisected in order to ascertain whether there were any additional calculi left.

DESTROYING THE UROGENITAL DIAPHRAGM OR PELVIC FLOOR AS A MEANS OF RELIEVING PROSTATIC ISCHURIA: A NEW OPERATION.

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PROSTATECTOMY is a disappointment in one respect. It has become a fairly easy and rapid operation, but it causes too many deaths. This makes it advisable only in selected cases. The great majority of prostatic patients get on so well under other measures that the risk of prostatectomy is far greater than the risk of palliative, non-operative management.

What is needed to popularize any operation here is to find a radical-cure method, practically free from risk of death and of complications, such as rectal and perineal fistulas.

The ideal method would leave the urinary tract unopened, and would, therefore, involve no more risk to life than, say, herniotomy, the removal of a lipoma, or any moderate external operation usually called safe in absence of organic disease. There is nothing in our experience to warrant the hope that we will open the bladder as we now do the peritoneum with virtually no risk. Nobody of much experience claims that a long series of cystotomies can be performed without a regular percentage of deaths. If he claims immunity from risk in opening the bladder, even in good subjects, he cannot show any large series of cases to prove it. All the care and antisepsis known have not made lithotomy take the place of lithotrity in percentage of recovery. I have known a number of good operators who thought it was going to do so, judging by the triumphs of antiseptic surgery elsewhere, and by a small series of successful cases with careful technique, but each one of these has met later his fair percentage of deaths, and the question stands exactly where it did before. Open operations

still have the greater mortality, if we may judge from the very extensive reports of the East Indian surgeons, many hundred stone operations being reported by individual surgeons.

If a method of dividing or relieving the prostatic ring entirely from without could be perfected, probably, instead of 5 or 10 per cent., the mortality would be less than 1 per cent., and our aged patients would be kept but a few days recumbent as against several weeks by present methods.

We are not accustomed to consider the male pelvic outlet as of surgical importance, but we must now revise our ideas of pathogenesis and treatment of prostatic obstruction, if my theories are true, and concede that the bones and ligaments of the pelvis also have much to do with compressing the urethra

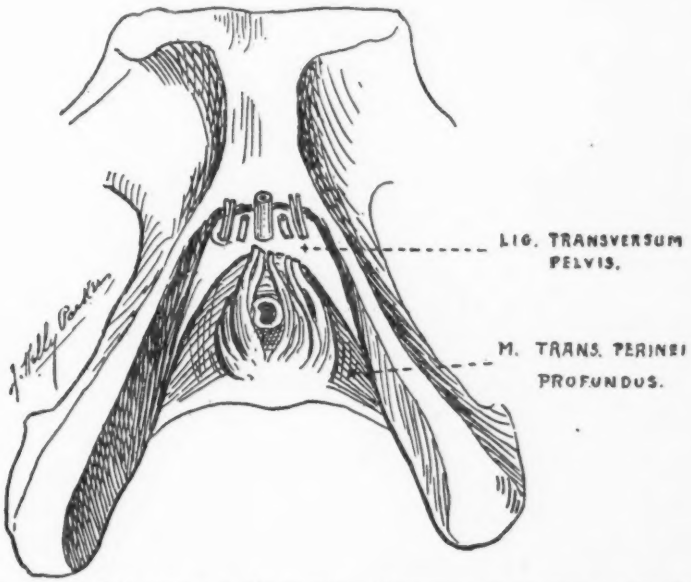

FIG. 1.—Immovable anchorage of the prostate. Ligamentum transversum pelvis. Vessels and urethra perforating.

in prostatic ischuria. Unless there is crowding together of the walls of the prostate by outside pressure, enlargement alone will not cause stoppage. Were the prostate free to expand laterally instead of into its own lumen, enlargement of the

organ would seldom cause dysuria, as the vesical sphincter is not a part of it. At any rate, many very large prostates have come under my notice in which there was no retention and no cystitis. A much smaller one, bound tightly against the pubis and subject to lateral pressure from the pubic rami, will often give complete obstruction. The organ, when enlarged by myomata or hypertrophy (like a myomatous uterus), lacks room in the bony pelvis, and crowds all the other organs and itself until it obstructs its own canal.

The prostate sits in a rigid triangle, having one side of ligament and two of bone. It is exceedingly firmly fixed in this narrow box by the short, hard band called the triangular ligament and the two prostato-pubic ligaments. These effectually prevent any backward motion into the looser and wider space behind, except in so far as the ligamentous fibres can stretch. The triangular ligament (ligamentum transversum pelvis) also forms a perfectly rigid floor, on which the organ is firmly seated and through which the urethra perforates, thus establishing, immovably, the position of neck of the bladder, prostate, and bulb.

A consideration of these anatomic and pathologic points led me to devise an operation for cutting loose the gland from its pubic and lateral ligaments, and partial destruction of the pelvic floor or urogenital diaphragm, with dislocation backward of the whole mass. This means such a radical departure from the old technique that a few words of explanation seem necessary.

About three years ago ("Infrapubic Section," *Journal of the American Medical Association*, October 18, 1902) I described an operation for doing this. I have now modified it, and I think improved the technique, and in a number of cases omitted incising even the capsule of the prostate, relying solely on its backward displacement to effect a cure of the obstruction.

The operation may be called a prostatolysis or displacement of the organ from between the jaws of the pubic rami to a looser position behind and below. This involves the practical destruction of the urogenital diaphragm to the extent

that it no longer forms a transverse musculo-ligamentous septum or floor holding and compressing against the bone, the neck of bladder, and pars prostatica urethræ.

TECHNIQUE OF OPERATION.

I have found only one incision really serviceable for this operation, although I considered three routes which seemed possible, viz.: (1) Suprapubic; (2) transpubic by symphysiotomy; (3) infrapubic, *i.e.*, in front of the urethra.

The suprapubic barely enables one to touch the prostate before opening the bladder. I experimented in doing ordinary

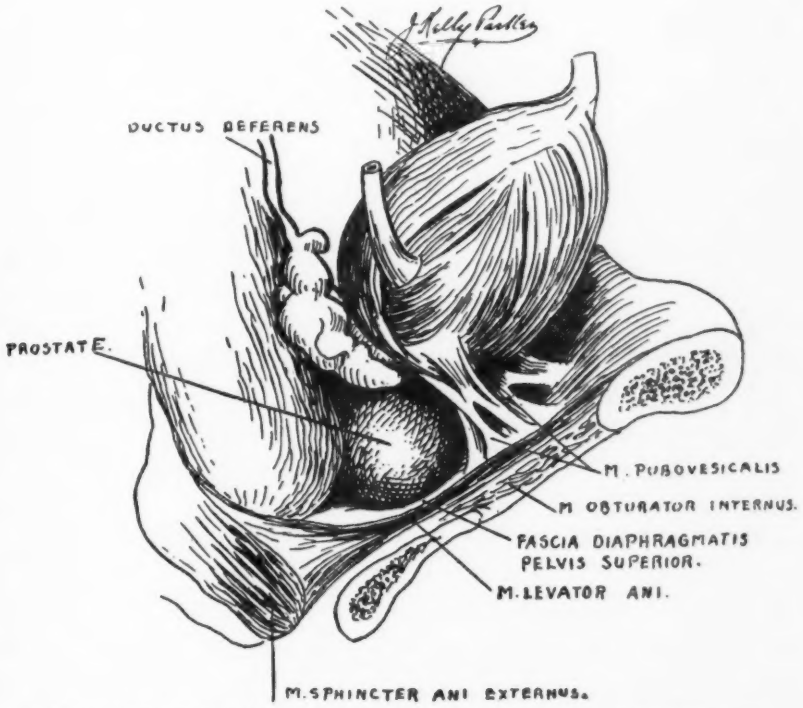

FIG. 2.—Prostate in its bony ligamentous box, supported by urogenital diaphragm.

suprapubic cystotomy, and easily found this out. Although the bladder separates very easily from the bone, I do not deem it a safe region to work in because of the dorsal vein and accompanying vessel just underneath the symphysis. These

same vessels I encountered from below, but I could there see and avoid cutting them. The transpubic or symphysiotomy route I considered too much in the category of a capital operation.

I started with the idea of an incision under the symphysis, a drawing apart of the two cords and detachment of the penis by severing the pubic attachments. This I tried on a cadaver, thinking I could then draw the neck of the bladder well down and have the prostate quite accessible. I was disappointed to find less access than I had hoped for in the cadaver, and I feared to try it in the living subject on account of danger to the dorsal vein and arteries of the penis.

If the right or left spermatic cord be drawn well forward, an incision about 8 or 10 centimetres long can be made from the symphysis parallel to the right or left ramus of the pubic bone. This gives a fair opening, but for safe and satisfactory work I have devised the large opening shown in Fig. 3, made by first pushing up the testes and holding them out of the scrotum with a truss or binder, and then cutting the skin and fat in a curved flap corresponding with the pubic arch. Any amount of room can thus be obtained, and all the structures of the perineum freely exposed. The apex of this flap is the pendulous portion of the penis. When traction is made, the opening becomes diamond-shaped, and shows the following structures from the symphysis backward (Figs. 1 and 2): (1) A space of fat about one-half inch wide; (2) the ligaments attaching the penis to the pubis, and the prostato-pubic ligaments between which pass (3) the crura of the corpora spongiosa each side; (4) a large vein, the dorsal vein of penis, with two smaller arteries and two nerves. The fibres of the levator ani muscle, embracing the prostate and the inner surface of the obturator internus, come forward in the lateral part of the field, and the deep fascia fills the whole space with a strong covering, which must be cut away in front before we get inside the pelvic floor. The internal pudic artery, and particularly a large branch to the bulb, must be avoided in doing this.

After pushing aside the vessels here encountered and dividing the pubic ligament of the penis (Fig. 4), the cutting off of the deep fascia and part of the levator ani allows the membranous urethra and prostate to be pulled into view by traction on the penis. The pubo-prostatic ligaments are now in plain view, and are made tense by our traction (Fig. 5). They appear to be about 1.5 or a centimetre long, and if they are both divided, the prostate will come still further into view. This partial destruction of the pelvic floor is permanent, and is of great value in preventing further compression of the prostatic urethra by the grasp of the levator ani. It also makes the bladder prolapse a little, so that there is no longer a retroprostatic pouch, but the orifice of the urethra becomes the lowest point.

I advised this much dissection (see my first paper) formerly, but I believe now it is well to cut the pelvic diaphragm supporting the prostate along both lateral borders. As soon as this is done, the whole mass, including prostate and neck of bladder, falls freely backward and downward, almost as if it were herniating into a new position. As this is the aim of the operation, it need cause no anxiety. The practial difficulty I have found was in making these lateral cuts without too profuse hæmorrhage. Theoretically, if the line of section is close to the capsule, we should get only small arterial branches unless we injure the artery of the bulb. The venous plexuses around the prostate and the numerous transverse branches caused so much trouble in two cases that I treated the lateral supports like the broad ligaments in hysterectomy. After the finger has made a small opening through the urogenital diaphragm, its ligamentous and muscular fibres can be held between the thumb and finger. The important vessels are close to this plane. From the operator's stand-point, it is much as if he were doing a hysterectomy and had the broad ligament in his grasp. I found a rapid and bloodless way to make the section was by applying broad ligament forceps, cutting between them and the prostate, and then using hæmostatic sutures on the stumps. With the anterior vessels I have

had no trouble, since they can be seen and avoided. It seems desirable to avoid in all cases destruction of the dorsal arteries, veins, and nerves of the penis.

The operation of prostatolysis is complete when the side attachments of the prostate are divided (Fig. 5). It will be noticed that the organ falls not only more backward, but also nearer the perineal skin, like a prolapsed uterus, even forming a sort of rectocele to the touch. The wound should now be closed with only small capillary drains in the corners. The testes easily find their way into the loose dartos again. Little reaction or shock follows this operation. There is scarcely any danger of injuring bladder, rectum, or urethra in doing it.

Beside a great and lasting relief from the obstructive symptoms, a practical benefit patients get from this operation is relief from rectal spasm associated with dysuria. This comes from weakening the muscular floor, which merges with the anal sphincter externus. The levator ani fibres embrace the prostate. The latter is normally held in the grip of the muscle, and is both lifted and compressed by its contraction. When enlarged, this action becomes exaggerated, as the organ is increased in breadth, so that the muscular fibres of the pelvic floor are less parallel as they pass it, and hence the prostate is much more powerfully squeezed as they contract. The contraction of this muscle, which ordinarily lifts both the anus and prostate and assists in expulsion, now fails to lift the great tumor, and only squeezes it tighter together, while at the same time the anus is forced against it. In many cases the result of this is not only to compress the urethra and increase tenesmus, but to cause functional derangement of the anus and rectum, so that patients suffer acutely from rectal tenesmus every time the bladder is strained upon, and also suffer reflex vesical spasm whenever the rectum contracts. This combination of symptoms has probably been met by every one, and is not confined to cases with cystitis. Patients so affected often think they have piles, when in fact no tumors or proctitis are present.

Of course, another element in the rectal disturbance is

the backward pressure of the prostatic tumor higher up on the rectal wall, causing much the same symptoms as a retroflexed uterus. The only wonder is that all prostatics do not have this class of symptoms. As a matter of fact, a fair minority do have them.

The falling back of the prostate from this operation does not make further pressure on the rectum, because the bladder neck, rectum, and coccyx all are simultaneously released, and all move backward together from the cutting of the urogenital diaphragm in front. Every half-inch backward the prostate can go brings it into a wider space between the bones, and the general result is a great loosening up of all the structures concerned in pressure on the neck of the bladder.

A backward and downward displacement of the bladder outlet is a very valuable aid to urination, also, by abolishing the retroprostatic pouch of the bladder. This pouch forms by the sagging of the posterior wall behind the elevated prostate, which, from its firm anchorage to the rami, cannot descend. Relieving the prostate allows it to become again the lowest point, so that the bas fond is funnel shaped.

Evidence of the value of changing the position of the outlet is the permanent good results sometimes following drainage by suprapubic section. The real value of suprapubic cystotomy is in the effect it has of ventral fixation. This draws up the retroprostatic pouch, and even the prostate itself. It fails often of good result because it does not relieve the tension of the pelvic floor. The existence of this retroprostatic pouch is easily demonstrated in some individuals by passing the urine, first in a sitting, then in a standing, and last in a knee-chest or hand-and-knee posture. Certain patients can by this change evacuate a number of ounces more at once with each change of posture.

CONCLUSIONS.

1. The male pelvic outlet is a narrow bony ligamentous triangle, often too small for the senile prostate.

2. The overgrown prostate would not obstruct the blad-

der were it not compressed between the jaws of the pubic rami.

3. The triangular ligament and urogenital diaphragm hold the bladder neck and prostate immovably between these bones.

4. On cutting away these bands, the constricted overgrown mass falls back into a wider space, and ceases to be obstructed.

5. Incidentally, great relief of rectal reflexes and spasm results.

6. The retroprostatic pouch is abolished and the bas fond becomes a true funnel, with its outlet at the lowest point.

7. The author's technique is simple. He has borrowed one step, that of the deep hæmostasis, from vaginal hysterectomy.

PROSTATIC AND PERI-PROSTATIC ABSCESS.[1]

A CONTRIBUTION TO THE STUDY OF THESE CONDITIONS AND THEIR TREATMENT BY OPERATION.

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PROSTATIC Abscess occurs frequently, but in many cases it is not recognized until the suppuration has destroyed important structures. It is customary to describe suppurations in and about the prostate and the operative treatment of these conditions in general terms, and these descriptions often are vague and unsatisfactory.

In presenting this subject it is necessary to define the exact meaning of the terms prostatic abscess and periprostatic abscess, because these are not used with the same significance by all writers.

A prostatic abscess is a localized collection of pus within the capsule of the prostate, due to an infection extending from the urethra. The abscess may be single or there may be multiple abscesses.

Periprostatic abscess is an extension of the infection from a prostatic abscess outside of the capsule. The pus in a periprostatic abscess may be confined above the triangular ligament, but it may extend into the perineum or ischiorectal region.

Prostatic and periprostatic abscess may occur as the result of tuberculous infection or as the result of malignant disease.

Abscess of the prostate occurs most frequently from the extension of an acute or of a chronic infection of the posterior urethra, especially in those who have had repeated attacks of gonorrheal urethritis. The improper use of injections or irrigations or ill-advised instrumental treatment of the urethra often is the exciting cause. Prostatic abscess

[1] Read before the New York Surgical Society, October, 1904.

may occur as a complication of urethral stricture, and usually in these cases it is the result of the frequent or violent use of instruments. It is not an uncommon complication of prostatic enlargement and occurs especially in those who habitually use a catheter. It is frequently the cause of sudden retention of urine in these cases.

A description of the pathological anatomy of prostatic abscess presents some difficulties. Post-mortem specimens of the disease, except in its later stages, rarely come under observation.

From the examination of a large number of cases at the time of operation and of a number of post-mortem specimens, I am convinced that prostatic abscess usually begins by the extension of an infection from the urethra into the gland ducts of the prostate. The infection sometimes may occur through a wound of the surface of the prostatic urethra, but infection through the gland duct is more common. The suppuration may be confined to one or more of the excretory ducts, or the infection may extend into the gland tubes and involve one or more of the prostatic lobules, and by extension it may destroy more or less of the entire gland.

Each lobule of the prostate is composed of a number of tubular glands; the excretory ducts from these empty into the urethra on each side of the verumontanum. The excretory ducts are formed by the union of smaller ducts and these latter communicate with the terminal gland tubes. The secretion from the tubules in each lobule is discharged into the urethra through one excretory duct. Infection, therefore, of a single duct should affect the tubes in only one lobule, but when there is infection of more than one duct the foci of suppuration are multiple, and these different foci frequently open into each other and form a single abscess.

Prostatic abscess is not caused always by the same infective agent—although the gonococcus seems to be the most frequent cause. The infective agent is sometimes among the least pathogenic of the pyogenic cocci, and this I think should lead us to attach much importance to the various accessory causes which render the urethra and prostate incapable of resisting even these mild pathogenic bacteria.

The non-bacterial factors are as important etiologically

as are the essential agents of infection. Among these the most active in causing prostatic abscess is the modern treatment of gonorrhœa by irrigation of the urethra from the external meatus; and the too frequent and unnecessary use of instruments in the urinary passages which is so common at the present day.

There seems to be much confusion as to the different kinds of prostatic inflammation, and clinically abscess is often mistaken for acute prostatitis. When an infection from the posterior urethra extends into the prostatic ducts, and preceding the formation of an abscess, there is an increase in the size of the prostate. This is caused by retention of the secretion in the lobules communicating with the infected ducts which are obstructed by the swelling of the mucous membrane of the urethra and by an accumulation of inflammatory exudate. The gland tubes are distended and impede by pressure the circulation in the veins. The œdema of the prostate is increased by anything which increases the congestion as, for example, by the frequency of urination and the straining to empty the bladder which are so characteristic of cases of acute prostatitis. This swelling of the prostate caused by retention of the secretion in the glands and by œdema may subside without the formation of an abscess. The excretory ducts discharge the secretions into the urethra; the obstruction to the venous circulation is thus relieved, and the swelling of the prostate subsides. Small abscesses may occur and open into the urethra and may thoroughly discharge their contents; but a small abscess which has opened into the urethra by an opening too small to efficiently drain it may be the source of great distress and annoyance to the patient. A persistent urethral discharge which relapses frequently is due often to this cause and there is always the danger of recurrence, or of an extension of the abscesses. Many cases of relapsing posterior urethritis, and many which are called chronic follicular prostatitis, are really cases of imperfectly drained prostatic abscess. A prostatic abscess may be confined within the capsule for a long time, sometimes for several weeks, without opening into the urethra. An abscess freely drained by a large natural opening into the urethra often may heal without operation, but abscesses of

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the prostate which open into the urethra spontaneously often require operation.

Le Dentu's statement* that abscesses of the prostate which open spontaneoulsy into the urethra usually do so by openings proportionate to the size of the abscess cavity is contrary to my experience. Therefore when an abscess of the prostate opens into the urethra spontaneously an operation is required, unless the drainage is efficient.

The cavity of the prostate abscess as felt by the finger through a perineal opening is irregular in shape and this is especially marked when several smaller abscesses unite together. The cavity is traversed by fibrous bands which are formed of the stroma of the prostate.

Infiltration of urine does not occur always into abscess cavities which open spontaneously into the urethra, even when the openings are of large size; but when infiltration of urine does occur, the intensity of the infection usually is increased, and the suppuration extends more rapidly.

Abscess of the prostate begins in that portion of the lateral lobe which lies behind and at the side of the urethra, and the infection usually extends towards the apex of the gland. When an abscess opens spontaneously into the urethra, the opening is found upon the floor or upon the side of the urethra. It is not difficult to explain why abscess of the prostate should open in this situation; the pus follows the line of least resistance and finds its way to the urethra along the fibrous bands which separate the lobules and which converge behind the urethra at the central nucleus. The mucous membrane of the prostatic portion of the urethra upon the floor and below the verumontanum is thin, and is closely attached to the prostate; in the supramontanal region of the prostatic urethra the mucous membrane is thicker. Abscess may occur in both lateral lobes simultaneously, but usually it is confined to one side of the prostate.

When an abscess of the prostate does not open spontaneously into the urethra, but extends outside of the capsule, the pus is found between the rectum and the prostate; it

* Des Abces Chauds de la Prostate et du Phlegmon Periprostatique. Segond, Paris, 1880, page 53.

may extend into the perineum or ischiorectal fossa, and in some rare cases it may find its way into the prevesical space. I believe that periprostatic suppuration is due always to neglect or to a failure to recognize the original seat of the disease, and that it can be prevented by an early operation. The spontaneous opening of a prostatic abscess or periprostatic abscess into the rectum is regarded by many writers as a common occurrence, but this seldom happens, except in cases in which operation has been too long delayed.

I have observed that when a prostatic abscess extends into the perineum there is also suppuration about the membranous urethra which begins in or about Cowper's glands or the glands of Littré, and that the latter is the cause of the perineal infection.* In some cases the perineal suppuration seems to have extended from infection of the intrabulbar glands. I have seen not a few cases of perineal abscess in which suppurating foci above the triangular ligament were detected only after the membranous urethra had been opened and the prostate explored by the finger. In many cases of ischiorectal abscess the suppuration originates in the prostate. Segond has given an interesting explanation of the course which the pus from a periprostatic abscess follows in reaching the perineum and ischiorectal fossa.†

If a prostatic abscess opens spontaneously into the urethra, and extends also outside the capsule, and opens either into the rectum, the perineum, or the ischiorectal fossa, troublesome

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* This observation has been confirmed by Motz and Bartrina. Ann. des Mal. des Organ. Gen Urin. November 1, 1903, page 1624.

†Des Abces Chauds de la Prostate et du Phlegmon Periprostatique, Segond, Paris, 1880, pages 86, 87.

"Les données de l'anatomie topographique montrent les différentes voies qui s'offrent au pus lorsqu'il veut sortir de sa loge. Une préparation fort simple permet d'acquérir à cet égard des renseignements précis. Il suffit d'ouvrir la loge rétro-prostatique par son bord supérieur et d'explorer ses parois pour reconnaître immédiatement quels peuvent en être les points faibles. Voici comment il faut procéder:

"Le bassin d'un sujet, jeune ou vieux, mais sans lésion abdominale, étant séparé du tronc, le rectum sectionné et lié a son extrémité supérieure et les organes du petit bassin soigneusement respectés, on attire la vessie en avant, de manière à mettre en évidence le fond du cul-de-sac

fistulæ may result which could have been prevented by an early operation.

The symptoms of prostatic abscess and of periprostatic suppuration vary in different cases and their intensity depends upon the character and extent of the infection and the clinical conditions under which they occur. The symptoms of an abscess which occur in the course of an acute gonorrhœal infection of the urethra differ from the symptoms of an abscess in an old prostatic. A small abscess situated close to the urethra causes more suffering than a large abscess which has invaded the periprostatic tissues. A prostatic abscess cannot be distinguished always by its symptoms alone from an acute prostatitis, and a positive diagnosis can be made only by direct examination of the parts. It requires considerable practice to detect the presence of pus positively in every case.

The principal symptoms of acute prostatic abscess are partial or complete retention of urine, pain, and rectal tenesmus. These symptoms occur also as the result of other diseases of the prostate and the history of each case is necessary to a

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recto-vésical. En ce point, on pratique sur le péritoine une incision transversale, longue de deux travers de doigt, puis, on introduit son index par l'incision, entre le rectum et l'aponévrose prostato-péritonéale. La laxité du tissu cellulaire est telle, que l'on croit pénétrer dans une bourse séreuse: sans le moindre effort, on arrive sur la face supérieure de l'aponévrose moyenne. Là, on éprouve un arrêt, et le doigt ne peut plus avancer. En arrière, on sent la paroi molle et dépressible du rectum; en avant, la prostate et les vésicules. Sur les côtés enfin, on est bridé par les solides attaches rectales des aponévroses latérales de la prostate. Si maintenant, par des pressions exercées avec la pulpe de l'index, on essaye de forcer les limites de la loge, on constate ce qui suit:

"Sur les côtés, dans toute leur hauteur depuis l'aponévrose moyenne jusqu'au niveau de la base des vésicules: résistance absolue, solide, pour ainsi dire infranchissable.

"En bas et sur la ligne médiane: résistance médiocre; l'index pénètre sans trop d'effort et gagne le périnée antérieur.

"En bas et en dehors; résistance très faible; une pression légère conduit immédiatement en pleine fosse ischio-rectale.

"En avant et sur les côtés, on est barré par la jonction de l'aponévrose prostato-péritonéale et des aponévroses latérales, ou, mieux, par l'adhérence intime de ces dernières avec avec la glande."

diagnosis. The retention of urine may develop slowly, or it may come on suddenly depending upon the acuteness of the infection and the situation of the abscess.

At the beginning of an acute prostatic abscess there is usually a distinct chill or a chilly sensation; coincident with this chill or following it the temperature rises, but usually the fever does not exceed two or three degrees above the normal. I have noticed in many cases than in twenty-four or forty-eight hours the temperature falls to normal or to nearly normal and so remains. This fact is sometimes misleading, because the majority of authors describe as one of the symptoms of prostatic abscess and periprostatic abscess a continued and irregular rise and fall of temperature; this occurs only exceptionally, and is an indication of a general septic infection.

The spontaneous opening of a prostatic abscess into the urethra is accompanied by an unusual flow of pus, the quantity depending upon the size of the abscess and the size of the opening. The pus appears at the meatus and also flows backward into the bladder, and then appears with the last urine passed at each urination. In these cases, when the drainage is imperfect this symptom persists. When the drainage is efficient, the quantity of pus rapidly diminishes, and this is associated with a diminution in the intensity of all the other symptoms.

Abscess of the prostate is often ruptured into the urethra during the rectal examination incident to diagnosis. In some cases slight pressure upon the prostate causes a flow of pus from the meatus. An abscess frequently is ruptured into the urethra during catheterism practised for the relief of the retention of urine. When abscess of the prostate occurs as a complication of prostatic enlargement, the retention of urine becomes complete, catheterism becomes more difficult, and is painful; the frequent use of the catheter is imperatively demanded and the suffering of the patient is great. In cases of this kind perineal prostatectomy is the operation of choice.

The symptoms of pain and retention are sometimes relieved when the pus from a prostatic abscess extends outside the capsule. The suppuration does not extend often into the perineum or into the ischiorectal fossa unless the abscess in the prostate is associated with abscess in Cowper's or

Littre's glands or the intrabulbar glands of the urethra, and I believe that in nearly all cases the perineal suppuration begins in these glands.

An examination by rectal touch is necessary to a positive diagnosis of prostatic abscess, and this always should be combined with counter-pressure first over the pubes and then upon the perineum. In the earlier stages of abscess it is impossible always to distinguish between the congestion and œdema of acute prostatitis and that of abscess, but I believe that acute prostatitis without suppuration is rare when the symptoms have existed for more than a few days and when there is complete or partial retention of urine. In an abscess confined to one side of the prostate, the affected lobe is usually more swollen than the other. Fluctuation or a point of softening is present in many cases, but, unless the abscess is large and the pus near the posterior surface of the gland distinct fluctuation cannot always be detected by rectal touch. If one waits for fluctuation before operating, much valuable time will be lost and important structures destroyed. I have found extensive abscess of the prostate in cases in which by rectal touch I had failed to find fluctuation.

The outline of the prostate in cases of abscess is sometimes obscured by œdema of the tissues in the anterior wall of the rectum. This is true especially in cases of periprostatic suppuration and in cases of prostatic abscess associated with suppuration about the membranous urethra.

In most cases of prostatic abscess I have found that the urine contains a larger percentage of albumen than can be accounted for by the pus. This symptom is one to which I attach considerable importance in doubtful cases. The albumen seems to be the result of an acute inflammatory œdema, the serum escaping into the urethra.

Abscess of the prostate should be recognized and operation performed before the pus has extended beyond the capsule, and when possible before the abscess has opened into the urethra. I am convinced that I have shortened the duration of the disease by operating before the signs of fluctuation could be detected by rectal examination, and in all of these cases I never have failed to find one in which there was not suppuration.

An operation is indicated at the earliest possible moment unless the abscess has opened into the urethra, but in many cases in which this has occurred, I believe an operation will hasten the recovery. An abscess which has opened into the urethra by a small opening requires operation quite as much as one which has not opened into the urethra. A periprostatic abscess always requires operation.

In treating prostatic and periprostatic abscess by operation, all suppuration foci should be freely opened and thoroughly drained; this should be done by the most direct route, with the least possible injury to surrounding structures. To this general principle I wish to add that in every case the membranous urethra should be opened and the prostatic urethra should be explored through a median perineal incision.

The principal operations which have been used in the treatment of prostatic abscess are:

1. Incision and drainage through the anterior wall of the rectum.

2. Mechanical opening of the abscess by means of a sound passed into the urethra.

3. Incision through the capsule and sheath after exposing the posterior surface of the prostate by a curved prerectal incision.

4. Drainage through a median perineal section.

It would be unnecessary at the present time to speak of opening a prostatic abscess by incision through the anterior wall of the rectum; or of opening an abscess of the prostate by an instrument passed into the urethra, except that these methods are still recommended in some modern text-books which have the imprimatur of recognized authority, it is necessary therefore to call attention to these operations even if it is only to condemn their use for reasons which should be apparent to any intelligent modern surgeon. The operation of opening an abscess through the sheath and capsule after exposing the posterior surface of the prostate by a prerectal incision is that followed by most surgeons. This operation has disadvantages, and in many cases I believe is positively contra-indicated; an extensive wound is made which opens the space between the rectum and the posterior surface of the prostate, a proceeding unnecessary, even when the suppuration has extend-

ed outside of the capsule. When an abscess is small it is sometimes hard to find by this method. The operation unless performed early does not prevent the opening of the abscess into the urethra and the formation of a urinary fistula. If the abscess has spontaneously opened into the urethra before the operation, the danger of fistula is increased. Multiple abscesses are difficult to manage by this operation. In cases of periprostatic abscess, the anterior wall of the rectum may be seriously weakened by the disease, and there is then danger of a rectal fistula if the prerectal incision is used. It has seemed to me that the convalescence after this operation is unnecessarily prolonged, and that it does not meet the necessities of these cases as efficiently as a median perineal incision.

I treat all forms of prostatic abscess by opening them into the prostatic urethra through a median perineal incision, whether the pus is confined within the capsule or has extended outside the capsule, whether it is above the triangular ligament or has extended into the perineum or into the ischiorectal fossa. I am convinced that this operation is sound in principle, and that abscesses thus treated heal promptly and with less danger to the patient than by any other method. I am sure that this operation will commend itself to those who will properly perform it and take the trouble to carry out the treatment in detail.

The technique of the operation is simple. The patient is placed in the lateral lithotomy position; the membranous urethra is opened upon a staff; the prostatic urethra is dilated and explored by the finger; a finger of the other hand is passed into the rectum, and between the two fingers the extent of the abscess cavity can be defined. It is easy to appreciate by the sense of touch the part of the prostatic urethra over the abscess cavity; and the openings when the abscess has discharged spontaneously into the urethra can be felt easily. The abscess is opened by tearing with the finger through the mucous membrane; its cavity is explored, any fibrous bands which traverse it are broken down, its floor is made level with the floor of the urethra, and the opening in the urethral wall is enlarged sufficiently to insure thorough drainage. This is done entirely with the finger; to do it efficiently requires experience; rough and unskilful mani-

pulation may cause severe hæmorrhage. A catheter, No. 28 F or No. 30 F, is introduced through the perineal wound into the bladder, and is retained by tapes fastened to a waist-band. One or two strips of gauze are passed alongside of the tube to the edge of the abscess cavity, but the latter is not packed. The tube and gauze I remove on the third day, sometimes on the second. The case is then treated as a perineal section. The patient passes all urine through the urethra before the end of the second week; the perineal wound is healed at the end of the third or fourth week. Patients are out of bed at the end of the first week. Some cases require treatment of the posterior urethra for a short time after the complete closure of the perineal wound.

In cases of periprostatic abscess in which the pus is above the triangular ligament, the abscess cavity is opened and explored by the finger through the perineal incision; this is possible provided the floor of the membranous urethra is thoroughly cut to the apex of the prostate so as to divide the lower border of the triangular ligament. A large abscess between the rectum and the prostate is to be drained by a strip of gauze passed into the cavity alongside of the perineal tube; this is removed at the end of twenty-four or forty-eight hours. When the abscess has extended into the ischio-rectal fossa an additional incision is necessary to drain this space. Perineal abscess beginning in or about Littré's or Cowper's glands or the intrabulbar glands, should be similarly treated. The treatment of these cases I have considered elsewhere.*

The treatment after operation is an important element in the quick and thorough recovery of these cases. It requires time and personal attention, but the result is an ample recompense for the trouble. I append a few cases illustrative of the points I have endeavored to make clear in this communication. These are selected as fair examples from a great many similar cases treated in my service at Bellevue Hospital.

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* Observations upon the cause and treatment of perineal abscess and of periurethral suppurations above the triangular ligament. Medical Record, New York, October 28, 1905.

CASE I.—*Prostatic Abscess with Right Epididymitis, almost Complete Retention of Urine; Symptoms temporarily relieved by Spontaneous Opening of the Abscess into the Urethra; Recurrence of Symptoms; Operation; Recovery.*

Timothy N., aged twenty-nine years; United States; single; admitted April 7, 1902. First gonorrhœa when twenty-seven years of age; discharge lasted five months; was treated by injections. Three weeks before admission he had a second attack of gonorrhœa. On April 1 he developed an epididymitis, which confined him to bed for a week; for this he was admitted to the hospital.

On admission he had a right epididymitis and posterior urethritis. Two days later he began to have frequent urination with pain and rectal tenesmus and almost complete retention of urine.

Rectal touch showed the prostate to be enlarged, especially on the left side.. It was hot and throbbing, no fluctuation. He was treated by hot applications to the perineum, and the pain diminished, but the swelling in the prostate increased in size, and on April 12, there was fluctuation near the apex of the gland. The prostate seemed to be smaller. There was a profuse discharge from the urethra, the abscess having opened spontaneously. On April 13 the amount of discharge was increased, pain in perineum and the rectum had greatly lessened. Patient was passing urine freely.

April 14 the discharge was still profuse.

April 15, prostate was again swollen, but a marked depression could be felt on the right side, which when pressed upon caused profuse discharge of pus from the urethra.

On April 19 operation was performed. On opening the membranous urethra through the perineum, introducing the finger into the prostatic urethra, several small openings on the right side of the urethra were felt leading into an abscess cavity. At this point an opening was made with the finger and the abscess drained.

On April 22, the drainage and the bladder tube were removed.

May 3 patient passed all urine through the urethra and made a satisfactory recovery.

CASE II.—*Prostatic Abscess with Complete Retention of Urine, requiring the Use of Catheter for Ten Days; Symptoms relieved by the Spontaneous Rupture of the Abscess into the Urethra; Operation Refused; Persistent Urethral Discharge.*

James P., aged forty-four years; widower; England; admitted March 22, 1902. Had gonorrhœa when twenty-four years of age; the discharge lasted two months; no complications. Five weeks before admission he contracted a second gonorrhœa; was treated by internal medication; no local treatment. Three days before admission he began to have frequent urination, severe burning sensation along the urethra with rectal tenesmus and pain in the perineum. These symptoms increased, and on the day before admission he had complete retention of urine, which persisted until his admission to the hospital.

Examination showed a slight purulent discharge from the urethra, which contained gonococci.

Rectal touch showed the prostate swollen and indurated, especially the right lateral tube. There was œdema of the anterior rectal wall. As the result of straining at urination, he had a number of inflamed hæmorrhoids. The bladder was distended above the pubes. The urethra was free of stricture. Temperature was 100° F.; on the 30th it rose to 104° F., and then fell to normal on the 2d. A No. 14 F catheter passed easily and without great pain and forty ounces of urine were withdrawn; there was marked atony of the bladder. The urine was cloudy with pus, acid, contained albumen, but no casts. The catheter was passed at regular intervals, and the bladder was washed out with sterile saline solution once a day. On April 6 he was able to pass a few ounces of urine, which contained about one-third pus by bulk. The prostate was smaller; the abscess had ruptured and was draining into the urethra. Catheterism was continued until April 9, after which the patient was able to empty his bladder completely. The pus in the urine continued to diminish in quantity, but never entirely disappeared. On April 18 the patient was discharged at his own request. The prostate then was nearly normal in size; he was passing water about five times during the day and three times at night. Urine contained about 2 per cent. of albumen, excess of urates, moderate quantity of pus, and some red blood-cells. Operation was refused by the patient.

CASE III.—*Prostatic Abscess; Perineal Abscess; Double Epididymitis; Urethral Stricture; Abscess opened; Relapse of a Year Later; Slight Urine Leakage; Operation; Cure.*

J. M., aged thirty-one years; United States; single; admitted December 13, 1901. He had had a number of attacks of urethritis, the last attack was one year before admission. Two weeks after the urethral discharge appeared he developed an epididymitis upon both sides. An abscess then formed in the perineum, which was opened by simple incision at Fordham Hospital, New York. The wound healed promptly. A week before admission the urethral discharge returned, and two days before his admission a swelling in the perineum appeared at the seat of the former abscess; this increased rapidly in size and became very painful. The urine contained pus. There was a swelling in the perineum beneath the deep layer of the superficial fascia situated to the right of the median line; it was red and painful upon pressure.

Operation, December 14. Median perineal urethrotomy. A narrow stricture was found at the bulbomembranous junction, which was cut internally to No. 30 F. The abscess cavity contained about an ounce of pus, very little if any urine. It communicated by a small opening with the urethra behind the bulb. A small abscess found on right side of membranous urethra which had opened into the urethra; another abscess in the right lobe of the prostate. These were drained into the urethra. The bladder tube was removed the second day. Discharged cured January 11, 1902.

CASE IV.—*Prostatic Abscess with almost Complete Retention of Urine; Operation; Recovery.*

William J. C., aged thirty-two years; Irish; single; admitted March 29, 1902. Fourteen days before admission and three days after exposure he noticed a discharge from urethra. On the third day of the disease he began to have difficulty in passing water, with great frequency, pain and tenesmus. He applied at a dispensary, where he was treated by injections and by massage of the prostate. He had repeated chilly sensations and he thinks some fever. He had never had complete retention, but was obliged to pass water from fifteen to twenty times a day with much pain. Complained of a dull, heavy, aching sensation in

the perineum. He had little apparent urethral discharge, the urine was dark colored. Specific gravity, 1027, contained albumen, large amount of pus, excess of urates.

Rectal touch showed a large, hard, indurated right lateral lobe of the prostate without fluctuation, tender to pressure. Temperature on admission was 99° F. On the following day it rose to 101° F. A small point of fluctuation then was detected near the apex of the prostate. The symptoms continuing, operation was performed April 1. An abscess was found on the right side of the urethra which had not opened into the canal. This was opened and drained into the urethra. Patient was discharged cured on April 16.

CASE V.—*Prostatic Abscess opening spontaneously into the Urethra; Retention of Urine persisting, the Abscess was drained by Operation; Cure.*

James C., aged twenty-nine years; United States; single; admitted January 27, 1902. Two weeks before admission he had first attack of gonorrhœa; no treatment. On the fifth day he began to have frequent urination, burning and stinging pain in the urethra and perineum. He applied at a dispesnary; and was treated by internal medication. Day before admission he had complete retention of urine and increased pain in perineum. On admission he was suffering severely from retention of urine. His temperature was 99.5° F.

Rectal touch showed the prostate enormously swollen, especially on the right side. During this examination an abscess was ruptured into the urethra, causing the discharge of a large quantity of pus. A soft catheter passed easily; thirty-two ounces of urine were withdrawn; it was very cloudy, dense white sediment, acid, large percentage of albumen, no casts. As the retention persisted, operation was performed on January 29, 1902. Exploring the prostatic urethra, a large cavity opening into the canal was found on the right side. The opening was small in size and was near the apex; this was enlarged by the finger. The bladder was drained.

January 31 all drainage was removed.

On February 4 patient developed an epididymitis on the left side, which confined him to bed for about a week. He was discharged on February 25 cured.

CASE VI.—*Relapsing Prostatic Abscess; Retention of Urine; Abscess opening into Urethra during Catheterism; Imperfect Drainage requiring Operation; Recovery.*

C. M., aged twenty-three years; United States; single; admitted February 6, 1904. Four months before had gonorrhœa; for this he was treated by injections. Three weeks before admission symptoms of pain and frequent urination began, resulting in complete retention of urine; he was relieved by catheterism. Two days later he again had retention of urine and was relieved by catheterism. Since then he had had retention of urine twice; relieved by catheterism. Following the passage of the catheter a week before admission, a large quantity of pus was discharged from the urethra.

On admission he had a urethral discharge; urine was cloudy with pus; he had left epididymitis; the prostate was swollen, especially the left side.

Operation on February 7, 1904. Perineal section. The finger found several openings in the mucous membrane of the prostatic urethra which led into abscess cavities; these openings were united by the finger and the abscess drained into the urethra; a hooded perineal tube was inserted, as the hæmorrhage was quite profuse and the perineal wound was packed with gauze.

On February 10 the tube was removed, and for several days there was almost complete vesical incontinence.

On February 17 he passed some urine through urethra.

On February 26 he had perfect control of his urine and passed all of it through the urethra. He was discharged March 15 perfectly well.

NOTE.—One year afterwards this patient was seen. Urine clear; he had perfect control; No. 26 F sound passed easily. Prostate by rectal palpation normal. He had contracted syphilis, and is now under treatment for this malady.

CASE VII.—*Tuberculous (?) Prostatic Abscess; Pericowperitis; Perineal Abscess; Incomplete Operation; Recurrence of Abscess requiring Second Operation; Slow Convalescence; Perineal Fistula.*

F. S., aged seventeen years; single; admitted October 10, 1900. Denies all venereal disease. His present illness began Sep-

tember 1. He had painful urination with pain before and after the act. Seven or eight days later he began to have pain in the perineum, and a small swelling appeared; this had grown progressively larger. On September 15 the frequency of urination increased, and he had partial retention of urine. On admission his temperature was 99° F.

Examination showed in the perineum a median oblong swelling over which the skin was reddened. Distinct fluctuation. The urethra was free from stricture. There was a urethral discharge, which did not contain gonococci, but contained a rod-shaped bacillus resembling the tubercle bacillus.

Operation on October 12. Median perineal section: an abscess was found beneath the deep layer of the superficial fascia. This was opened and drained. Membranous urethra was opened. Examination of prostatic urethra failed to detect any sign of abscess. The tube was removed on second day. Patient did well until the eleventh day after the operation, when an abscess was discovered at the bottom of the perineal wound at the side of the urethra extending towards the groin. This was opened and drained, and on the 25th another abscess was discovered in the ischiorectal fossa. A second operation was performed on October 26. Membranous urethra was reopened; the finger introduced into the prostatic urethra found a large abscess in the left lobe, which communicated with that in the perineum, and there was also suppuration about Cowper's glands. These abscesses were opened into the urethra. An oblique incision was made beginning at the upper margin of the perineal opening and extending towards the left groin, which opened an abscess cavity in this situation; the abscess in the ischiorectal fossa was opened by a separate incision. The abscess cavities were drained and a tube was placed in the bladder. The patient's general condition was unsatisfactory and the wounds were slow in healing. He was discharged on October 29 with a small perineal sinus which had not healed, and through which a few drops of urine escaped at each urination.

CASE VIII.—*Prostatic Abscess and Perineal Abscess; almost Complete Retention of Urine; Abscess opened spontaneously into the Urethra with Inefficient Drainage; Operation; Recovery.*

J. O'R., aged twenty-five years; married; admitted Decem-

ber 6, 1900. He contracted a gonorrhœa in 1894, which lasted for six weeks, and again had a gonorrhœa in 1898, and had had a relapsing urethral discharge ever since. About three weeks before admission he began to have pain in the perineum, which was increased by exercise and on defecation. He had some difficulty in passing water, but never had complete retention of urine. Three or four days later a swelling appeared in the perineum. This gradually increased in size. He had chilly sensations with fever. On admission, temperature was 100° F. Urine was foul, contained large quantity of pus, many large shreds, albumen; specific gravity, 1018. There was in the perineum an ovoid swelling, more marked on the right side. Skin over this was red. Tumor was not very well defined, edges were hard. There was distinct fluctuation. There was no stricture. Right side of the prostate was enlarged and tender. Perineal operation, December 9, 1900. On cutting through the deep layer of the superficial fascia, an abscess was opened containing about eight ounces of pus. Membranous urethra was opened, and a large abscess cavity was found by the finger on the right side of the prostate communicating with the urethra; this was drained. Tube was put in the bladder. Tube and drainage were removed on fourth day. Patient passed his urine through the urethra on the ninth day and made a satisfactory recovery.

CASE OF AN HERMAPHRODITE.

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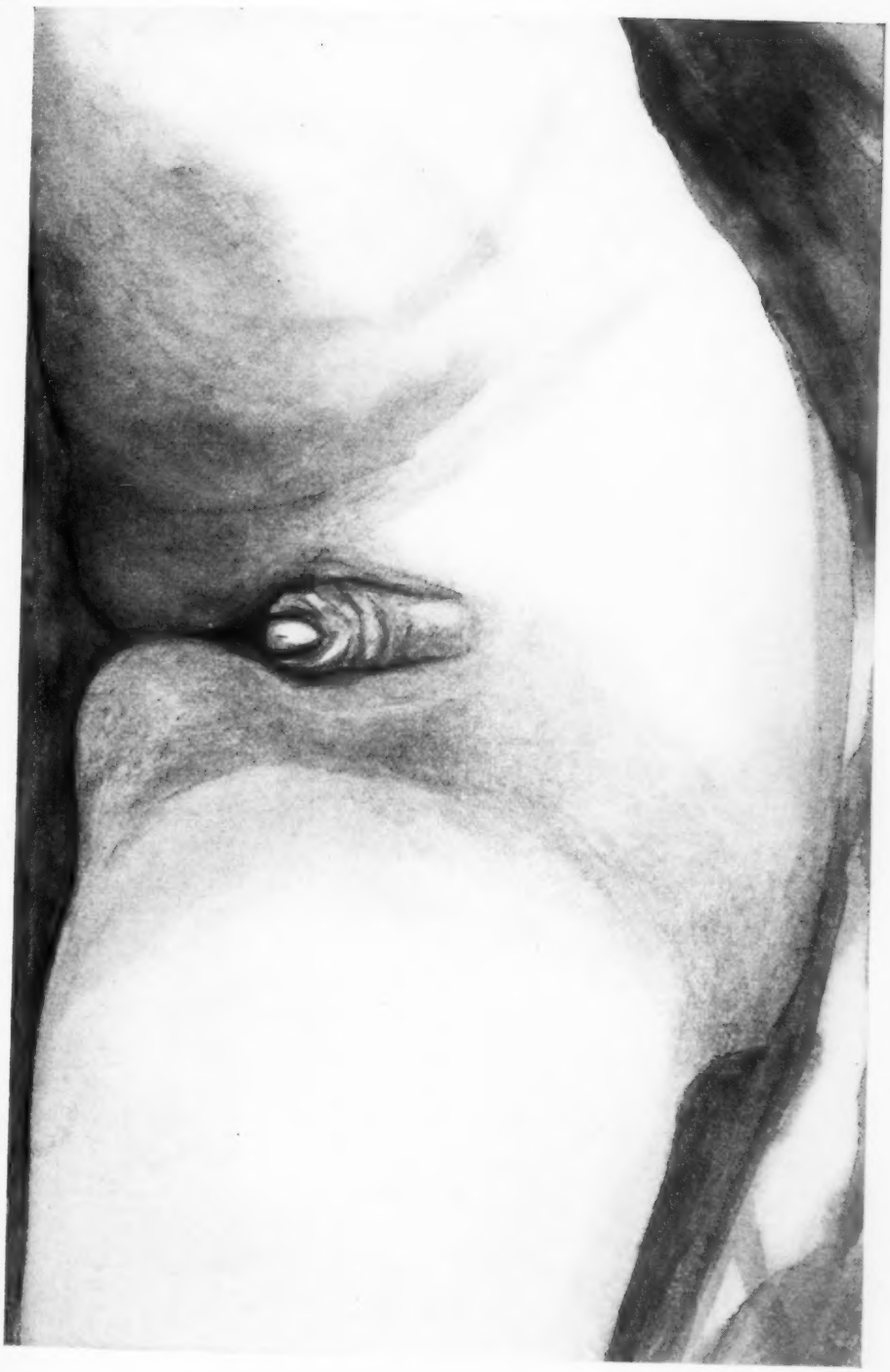
THE accompanying illustration is of an hermaphrodite, aged three years. The parents always supposed that the child was a female. Recently a physician had told them that it was a male. Although the child was still too young to have developed marked characteristics indicative of sex, the face appeared to be that of a girl.

An examination of the genitals showed that the child had an organ which presented every appearance of a penis corresponding to the age of the child. There was a perfectly formed glans penis and a prepuce. The prepuce was, however, adherent to the glans penis a little anterior to its base, and could not be retracted so as to uncover the entire gland. There was an hiatus in the prepuce, along the under surface of the glans, as represented in the accompanying illustration. On attempting to lift the penis from its position, it was found to be adherent along its entire lower surface, a deep sulcus extending along its whole length on either side. On separating the tissues from the sides of the penis, they presented the appearance of the labia majora. On lifting the glans penis, an opening was discovered, and under anæsthesia this was found to be large enough to admit the little finger. This opening extended upward like a normal vagina and had a length of about two inches. On inserting a catheter into the meatus it was found that the meatus was just at the opening of what appeared to be the vagina, but that the orifice of the urethra had less tissue between it and the vagina than normal, it being separated from the vagina anteriorly by a thin septum. The child had entire control of the passage of urine during the day, but was said to wet the bed at times at night.

A nasal speculum was inserted into the vagina, and an attempt was made to gain a view of its upper portion. It was found impossible to make a completely satisfactory examination without overdistending the vagina, so that the effort was aban-

doned. With the little finger in the vagina, a mass corresponding in all respects to the cervix could be felt at the top of the vagina, and on bimanual examination a smaller mass could be felt between the finger in the vagina and the hand above the pubes, corresponding in size and form to the uterus.

The conclusion arrived at was that the child had the reproductive organs of the female, that the clitoris had taken on the over-development of the penis, corresponding to it in all respects, except that it was adherent along its entire under surface to the underlying structures, and that the form of the prepuce corresponded, as shown in the picture, to the covering of the clitoris rather than to the prepuce in the male. What effect erections might have upon the organ could not be determined.



THE LAW OF ACCELERATING RISK IN CANCER.[1]

A MATHEMATICAL FORMULA FOR CALCULATING THE EXPECTANCY AND POST-OPERATIVE PROGNOSIS OF MALIGNANT GROWTHS.

BY E. WYLLYS ANDREWS, M.D.,

OF CHICAGO,

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Is there a Mathematical Law of Growth?—Cancer invades, conquers, and destroys the body of its victim, not by uniform or arithmetical progression, but in a geometrical or constantly accelerating ratio of progress. The late stages are manifold more rapid than the early stages. In an effort to state this law mathematically, I will consider the rate of progression and risk of recurrence as synonymous terms, and advance the following theorem:

1. *The risk of recurrence (or rate) in malignant growths increases as the square of the time of growth; or, conversely,*

2. *The risk of recurrence diminishes in the ratio of the square root of the time after incidence.*

Thus, doubling the time increases the risk of recurrence or metastases, not twice, but 2^2, or fourfold; tripling the time increases the risk 3^2, or ninefold; quadrupling the time increases it sixteen-fold, etc.

Because vital processes are difficult to measure, and because the exact age of a growth is not always known, it may not be easy to demonstrate this law mathematically; but it seems to coincide exactly with my clinical estimates of cases, and I cite the following reasons for believing in its accuracy:

Fundamental Conceptions.—Malignant tumors spread, not in a linear dimension, but centrifugally, from their atria in all directions, like an enlarging circle, or even a sphere. It

[1] Read before a joint meeting of the Chicago Medical and Chicago Surgical Societies, June, 1905.

is very rare for a growth to be so terminal as to spread in only one direction. This might possibly be true of a growth on a finger-tip, but would be temporary and exceptional. As an instance of radiating infection, a breast cancer invades quickly the axillary, cervical, and mediastinal lymph nodes; but it also soon involves the fascia down the chest to the abdominal wall, thus reaching the liver (Handley), or the skin and muscle across to the other breast (Heidenhain). Also it involves the lymph channels, following the intercostal vessels to the spine, causing skeletal deposits and cord lesions (paraplegia in several of my cases). It also invades the pleura along the line of the lymphatics, the perforating vessels, or muscles, and thus directly attacks the chest organs in some cases. In other words, it has about as many avenues of invasion as there are tissues surrounding it, and even the vascular system may aid in its dissemination.

Stated mathematically, the infection radiates in a sphere, with the primary focus as a centre. Like light, heat, and all radiations, it follows the law of squares. The superficial area, which is an index of the risk of metastasis, increases as the square of the diameter of the infected area. If a uniform growth in diameter takes place in a uniform time, then multiplying time by 2 would increase risk 4 times; multiplying time by 3 would increase risk 9 times; multiplying time by 4 would increase risk 16 times; multiplying time by 5 would increase risk 25 times; multiplying time by 10 would increase risk 100 times.

This soon brings us to infinite risk in finite time. In other words, a comparatively short time suffices to make every case infinitely dangerous or practically hopeless. This only restates theoretically what every surgeon knows to be mournful truth clinically.

What we lack to confirm this law clinically is means of locating the exact time of origin of any case. Theoretically, it is the date when the growth crossed the line between the microscopic and the macroscopic period. Practically, it is the accidental time of discovery of a neoplasm,—early in

accessible and exposed tissues, later in more concealed parts; perhaps never discovered before death in certain remote or unusual locations, as in the brain, prostate, or skeletal deposits.

The Law not a Death Warrant.—Discouraging as this law is when stated in its first or positive form, we may derive much comfort from the second or converse proposition as given above.

"*The risk of recurrence diminishes in the ratio of the square root of the time after incidence.*"

The law thus stated admonishes us that an early golden period is always given us for saving the life of the cancer victim, and imperatively commands us to take action during the brief and precious stage. We should look almost reverentially on the opportunity which then exists.

It is this curable stage only which is of strategic importance in surgery. Just what are its limits? Looking at the life history of any malignant case, we may consider it as composed of three periods: 1. The microscopic period. 2. The macroscopic period, before metastases. 3. Period after metastases or carcinosis period.

Of the first or microscopic period we know nothing except by inference.

For the carcinosis period we have little to offer therapeutically, save the hope that the X-ray, or some remedy yet unknown, may come as a sort of *deus ex machina* to the rescue.

Of the second stage, that of tumor building without metastases, we think we have abundant clinical evidence. Radical surgery should be mainly limited to this stage. By the law I have attempted to prove, I have obtained a working formula which, when applied clinically, will determine for us not perhaps the exact time limits within which it is safe to operate, but, at any rate, certain limits beyond which it is useless to operate for radical extirpation. As the conclusions arrived at have something of the authority of a law of nature, I will describe a little more fully the mode of demonstrating them by what I have ventured to call the "Risk Curve" plotted on a clinical chart.

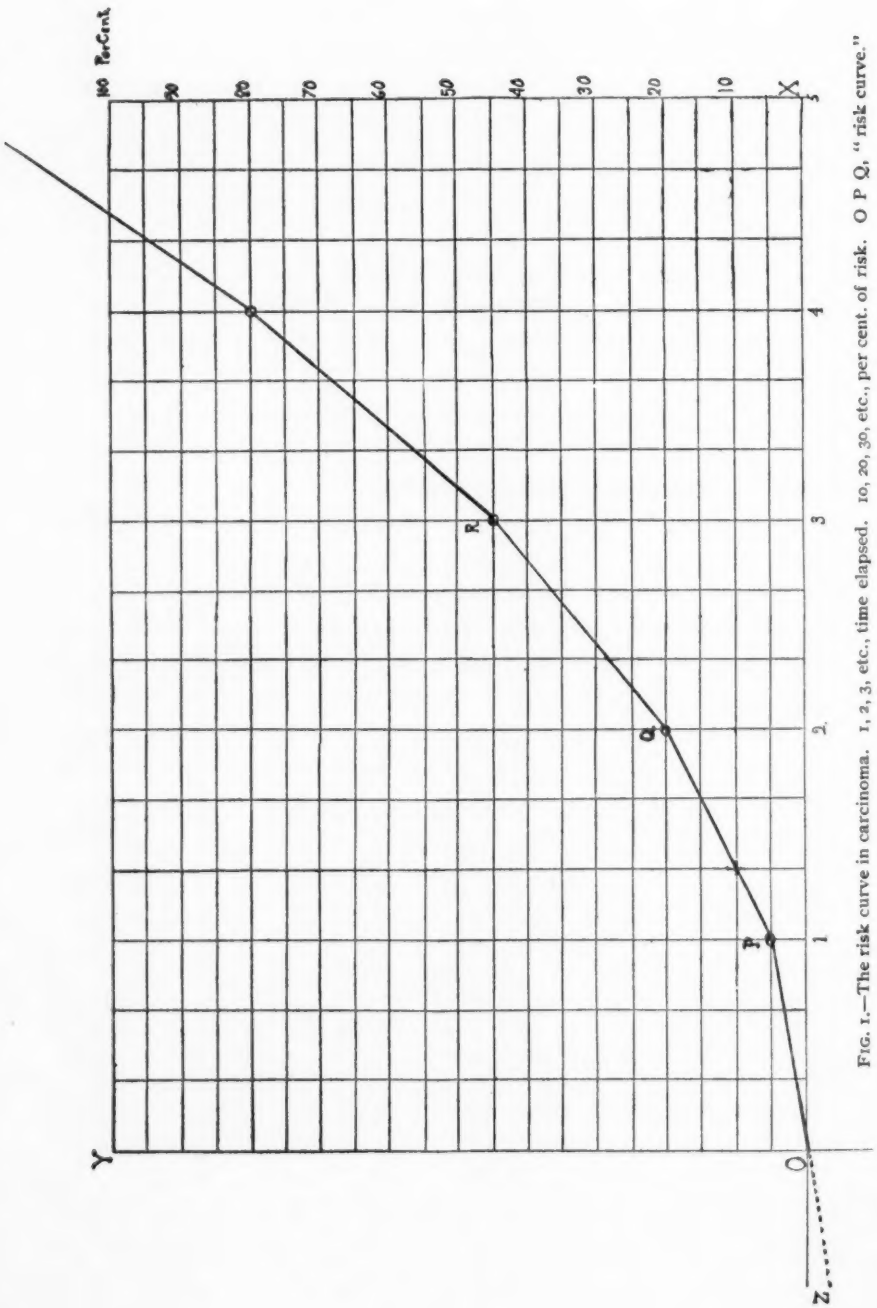

FIG. 1.—The risk curve in carcinoma. 1, 2, 3, etc., time elapsed. 10, 20, 30, etc., per cent. of risk. O P Q, "risk curve."

How to Plot the "Risk Curve."—The risk curve expressing mathematically the life chances of the patient is a function of two variable elements, viz., the rate of increase and the total age of the disease.

The coördinates *ax* and *oy* represent respectively the length or duration of the disease and the risk or probability of metastases. I have given a value to the abscissæ of 1, 2, 3, 4, 5, etc., representing time units, say of weeks or months, as we choose to assign them. The ordinates, 5, 10, 20, 30, 40, etc., stand for units of risk, say in parts of a hundred or percentages, 100 being a total of risk or a hopeless case, so that the higher risk lines are the ordinates above and the lower risk lines those below. We thus have a blank chart or scale marked in squares in two directions. Starting from *o* and moving upward, we enter various zones, or if you will planes, of risk, of values from zero to 100 per cent. Moving to the right, along *ox*, we cross the time abscissæ, which we give various values in different cases, so as to bring the life history of the disease into the compass of the card. The points, *o*, *p*, *q*, may now be located by the law of squares I have stated. Then the line, *o*, *p*, *q*, etc., will form a gently rising curve, at first nearly parallel to the base line, *ox*, thus remaining for a considerable time in a safe region, and afterwards rising sharply into a region of greater and greater risk, until after a certain period it is nearly vertical and crosses an increasing number of risk lines in each time space.

The dotted line, *zo*, represents the microscopic or previsible stage of the growth (if such a stage exist). At a certain time it crosses the base line ordinate at *o*, and becomes a visible or cognizable entity, thus entering on its life history, *o*, *p*, *q*, etc. At the theoretical first point of existence, its risk is *nil*. The lapse of the smallest amount of time carries it gradually above the base line, into an increasing danger zone.

To be able to plot the curve *o*, *p*, *q*, it is necessary to have data of the growth rate. This implies a knowledge from two examinations or a reliable history of how long it takes the mass, say, to double in size. I find it convenient to assign this time ratio to the space, 1, 2, 3; that is, if, a growth is known

to double in size in a month, the abscissæ represent months, etc.

Having fixed this index factor, the curve can be plotted by the law of squares I have already explained, and can be made to predict the future course of any case with great accuracy, so much so that I trust it in deciding the question for or against operating upon bad cases.

At the end of one time unit the risk rises to line $1 = 1$; in two units, to $2^2 = 4$; in 3 units of time to 3^2 or 9, and in 4 time units to 4^2 or 16, etc.

The percentages of increase will be the same in all cases. Only one factor varies, namely, the value of 0, 1, 2, 3, etc. It would be possible, therefore, to use one plotted curve for all cases by assigning different values to these time units. We can, on the other hand, represent graphically a slow or a rapid case by different curves by lengthening the time units proportionately to the rapidity found. Several curves can in this way be plotted on the same chart to contrast their rate of growth.

In whichever way we use the chart, we can lay down with fair accuracy the whole life history of the case, past, present, and future. I believe this will prove not only instructive and impressive for illustration, but accurate in prophesying the course and duration of tumors, if only our first data are reliable.

Clinical Test of the Law.—On the chart, two extreme cases, one extraordinarily rapid and the other unusually slow, both of which illustrate its accuracy, can be represented by the line, *o*, *p*, *q*, etc.

Case I.—Miss M., aged forty-seven years, robust and well in appearance, had in November, 1894, a small movable nodule, size one-half inch, in right breast. Known duration, three weeks. I gave a bad prognosis, but allowed a delay of one week for observation. Patient, however, waited six weeks, and consulted me in January, with the tumor increased sixfold, and already some glands in axilla. I estimate the growth at fully 100 per cent. weekly, and it proved to be the most rapidly malignant carcinoma mammæ I ever saw.

Plotting the curve of this case on the basis of a doubling

each week, we have the extraordinary result of a practically hopeless prognosis in five weeks, and apparently fatal result imminent in a few months. This actually happened. I removed first one breast and axillary contents, and the opposite one a few weeks later, patient dying in May, six months after the first invasion, with large metastatic masses in liver, both lungs, and pleuræ.

CASE II.—(The slowest I can remember.) Mrs. R. K., patient of Dr. C. P. Caldwell. Had slow-growing carcinoma of left breast. I estimated the time required for doubling at six months, basing this on history. This rate, plotted with the abscissæ representing six-months' intervals, gives a danger limit very slowly accelerated, and a fatal result years distant. Exactly this did occur. The breast and glands were removed by me, and patient had no recurrence for three years. I considered her cured.

Very slow redevelopment in the old breast scar and axilla then appeared, and patient eventually died of the cancer eight years after the first appearance.

I have tested this graphic method in a large number of cases by the past history, and a few by way of prophecy, and have every faith in its accuracy. By it we can exclude with fair accuracy all those cases which ought not to be operated upon. When the risk curve plotted by my law has risen to the upper half of the card, say to 90 or 100 per cent., it is useless to do other than palliative operations. There is no class of cases likely to discredit surgery more than those tumor operations so often done in which rapid recurrence takes place, and in which a subsequent review of the whole case shows patient's family and physician alike that the operation never really had a chance of succeeding. A careful application of this law will put us, at a middle stage of any case, almost in the position of one who has seen its whole course. I am certain that the first stages of any growth furnish the data for all the later stages, whether it be very slow or very rapid. Although each case has its own rate of progression, that rate once determined will accelerate uniformly, according to the law of squares.

I shall be very much interested to learn if these conclusions are not confirmed by the experience of other operators.

THE USE OF X-RAYS IN CARCINOMA.[1]

BY WILLIAM ALLEN PUSEY, M.D.,
OF CHICAGO.

In considering the use of X-rays in carcinoma, it would seem to be conducive to clearness first to determine the demonstrable facts concerning the influence of X-rays on carcinoma tissue, and then, in the light of these, to consider clinical findings. In this way I shall, as briefly as possible, take up the subject. I shall consider only my own work, because I can only speak with responsibility of it.

In the first place, it can be demonstrated that X-rays are capable of destroying carcinoma tissue on the surface of the body. This is shown by the behavior of cutaneous carcinomas or epitheliomas which are properly exposed to the influence of X-rays. In my experience, the type of epithelioma has made little difference in the result; all forms may be destroyed with about equal readiness by X-rays. By this I do not mean to say that all lesions yield with equal readiness. On the contrary, I see great variability in the resistance of these lesions. But, so far as I am able to determine, this is not so much a variation in the susceptibility of different types of epithelioma, as it is a variation in susceptibility of all of the tissue of different individuals; for, in the cases that are resistant, the surrounding healthy tissues seem to have as great relative tolerance as the diseased tissues. I have not been able to determine anything in the character of different types of epithelioma which enables me to predict whether a given lesion will be relatively susceptible or relatively insusceptible. But there is room for difference of opinion upon this point, and I am not ready to dogmatize upon it. The point that I wish to emphasize is that carcinoma tissue upon the surface can with practically unvary-

[1] Read before the Chicago Surgical Society, June 7, 1905.

ing regularity be destroyed with X-rays, and be replaced by healthy scar tissue.

When we come to carcinomas more deeply situated, we are not in possession of many authentic facts; but I have two cases from which I can furnish definite post-mortem data. These two cases were primary carcinomas of the breast. One of these, an old woman referred to me by Dr. Wyllys Andrews, had a large primary carcinoma of the breast without involvement of the skin, with enlarged axillary glands, and with spinal metastasis when the treatment was begun. The patient had vigorous X-ray exposures lasting about a month, with the production of a dermatitis which subsided completely before her death, about three months after the treatment began. Post-mortem, it was found that the breast was a mass of connective tissue without any carcinoma tissue remaining. The same was true of the axillary contents; they were converted into a mass of connective tissue without the remains of carcinoma. In the second case, an old woman referred to me by Dr. J. B. Murphy, there was a large primary carcinoma of the breast without involvement of the skin and with enlargement of the axillary glands. She had vigorous treatment for six weeks, with the production of only a mild reaction. About three months after I first saw her she developed an acute gastritis, from which she died. Postmortem, it was found by Dr. W. A. Evans that the tumor of the breast had been converted into a small fibrous mass about the diameter of and two-thirds the length of an index-finger. In other words, the carcinoma had been destroyed, and there remained in its place a small mass of scar tissue. In this case the axillary glands had not been affected. The difference in the findings in these two cases, in my opinion, depends upon the fact that in the first case the axilla had been sufficiently exposed, and in the second it had not. In these two cases, then, we had carcinoma tissue beneath skin and fat destroyed without destruction of the overlying tissues.

The foregoing are definite data which I can present as to the effects of X-rays upon carcinoma. How far are these applicable in the treatment of carcinoma? As far as epithelioma

is concerned, the subject can be very briefly stated. I believe it may be said almost without reservation that any epithelioma which has not metastases, and which has not deeply involved the subcutaneous tissue, may be symptomatically cured by X-rays. By symptomatically cured, I mean to say converted into healthy scar tissue, as healthy scar tissue as can be gotten after the excision of epithelioma. The superficial extent of the carcinomas is, of course, a factor of some consideration in the prognosis; but the most extensive epitheliomas that I have seen I have symptomatically cured with X-rays. I have seen lesions involving areas of 30 to 40 or 50 square inches converted into healthy scar tissue. Where there is deep involvement of the subcutaneous tissues, as in epitheliomas invading the orbit or extending down deep into the bones of the face, X-rays may fail; but I have seen unexpectedly successful results in cases of this sort, as, for example, in epitheliomas involving the bones of the nose. Where there are metastases in the contiguous glands X-rays usually fail, but here likewise at times we have successful results.

As to the permanence of the results in epithelioma, some of my cases have gone now more than three years without recurrence; and I believe that whenever you are able to get a satisfactory scar you may count upon a permanent result. As regards permanency of results, I believe the cases will bear a fair comparison with those treated by any other method. As to the range of application of X-rays in epithelioma, it may, in my opinion, be said that any case of epithelioma is suitable for treatment with X-rays in which, if a surgeon were operating, he would not feel called upon to remove the contiguous glands. If the case is one in which the removal of the contiguous glands is indicated, it should be treated surgically, and not with X-rays. That statement, I trust, covers the question of the treatment of epitheliomas of the lip with X-rays.

But, excepting epitheliomas, what can be done for carcinoma by the use of X-rays? Are the post-mortem findings, which I have reported in the two breast cases above, corroborated by any practical results in the treatment of subcuta-

neous carcinomas? Can any symptomatic cures be shown in unquestionable cases of subcutaneous carcinoma? Or can any unquestionable cases of carcinomas, other than epitheliomas, be shown which have remained well for the three-year period? I have some cases, authenticated by unquestionable authorities, which answer these questions in the affirmative. For example, in September, 1901, Dr. A. J. Ochsner referred to me a woman of about forty with the second recurrence of carcinoma in the chest wall. The breast had been removed by one of our most prominent surgeons; there was recurrence in the chest wall, which he removed, and a second recurrence soon after developed, for which the patient consulted Dr. Ochsner, who thought that further operation offered no hope, and referred her to me. She had then two ulcers in the scar, each the size of a fifty-cent piece, and they were surrounded by indurated nodular borders, and adherent to the ribs. This patient was symptomatically well by January, 1902, and she has remained well and been able to pursue a hard vocation ever since. Here is a case, then, which had had two recurrences and was regarded as hopeless by Dr. Ochsner, that has remained well for over three years. The following case, although it has not been well so long, is far more significant, because of the involvement of the supraclavicular glands. This patient, a woman of forty-six, referred to me by Dr. G. H. Brannon, of Manhattan, Ill., had had the left breast removed for carcinoma in September, 1901. When she was referred to me in April, 1902, there was a healthy scar attached to the ribs, but in the axilla there was a mass of fused hard glands, and another large mass in the supraclavicular space, which caused a very perceptible swelling above the clavicle. The arm was œdematous. The general condition of the patient was much reduced. Operation was out of the question. This patient had X-ray exposures at intervals extending over about two years, and has been under constant observation up to the present. Within four months after beginning treatment, the masses above the clavicle and in the axilla were reduced until they felt like small masses of scar tissue, and the swelling of the arm quite disappeared.

These palpable masses in the supraclavicular space and axilla remained, and I had about concluded that they were scar tissue and could not be made to disappear, when, much to my delight, after a series of exposures about a year ago they entirely disappeared. Here is a patient, then, with carcinoma in the supraclavicular space and in the axilla, well on the down grade three years ago, who regained her usual vigor within six months, and three years after beginning her exposures is in her normal, fairly vigorous health, and is symptomatically cured. Other similar cases could be reported, showing that these cases are not accidental. I have seen the same sort of disappearance in carcinoma masses in primary carcinoma of the breast and the same sort of symptomatic cures that have remained permanent to the present time.

The following case shows that something can be done in more inaccessible locations.

In April, 1904, Mrs. ——, about thirty-five, was referred to me by Dr. Sylvan Kunz. Six months previous the uterus and ovaries had been removed by Dr. Kunz for carcinoma. New nodules very soon appeared in the scar and, in spite of assiduous treatment in the usual ways, grew very rapidly. In April, 1904, there was a large nodular mass at the site of the scar in the vagina, larger than could be taken in by a Ferguson speculum. The patient's general condition was good. In four weeks under X-ray exposures, given directly per vaginam, this tumor had entirely disappeared, leaving no trace; discharge and hæmorrhage permanently ceased; and for a year now there has been no suspicion of recurrence. As far as the patient knows, she is perfectly well. Her physical condition is as good as it ever was.

From these cases we naturally pass to carcinomas within the cavities of the body, and upon this subject I can offer nothing that is definite. I have treated many cases of pelvic carcinoma and a good many of carcinoma in the abdomen and thorax. In many of these cases there has seemed to be very considerable amelioration in the condition, but in none has the result amounted to more than amelioration.

In the light of such findings, what is a reasonable attitude towards the use of X-rays in carcinoma? It is, it seems to me, that X-rays are entitled to consideration in all cases of carcinoma, excepting only those which are amenable to surgical treatment, and those in which the disease has already extended so widely that it is manifestly impossible to hope for benefit from any remedy which is not capable of selectively destroying carcinoma tissue, no matter where situated in the body. X-rays do not and cannot rise to such requirements; and doubtless no remedy ever will until some specific agent is found which is capable of causing the solution of carcinoma masses in the body in the way that potassium iodide, for example, causes the disappearance of syphilitic gummata.

In the foregoing statement, the inoperable cases which I mean to exclude from any hope of radical relief from X-ray treatment are the deep-seated cases in the cavities of the body in which widespread metastases have already occurred. In such cases as these, as, for example, in carcinoma of the mediastinum or of the abdomen, I believe it is impossible, without some improvement in our technique which I cannot foresee, that X-rays can hold out any prospect of a radical result. But I believe that something can be done even in these cases. We are all familiar with the way the spleen in leukæmia can be bombarded out of existence with X-rays without damaging the overlying skin. In the same way I have seen large masses of glands of Hodgkin's disease disappear from the mediastinum under X-ray exposures; and I have seen the same thing happen with similar masses of glands in the pelvis, so large that they rose above the brim of the pelvis and produced great œdema of the leg. If these things can be done with X-rays, it is not impossible to suppose that some effect can be produced upon masses of carcinoma tissue similarly situated; and if the cases of this sort treated with X-rays which I have observed indicate anything, they bear out this supposition. The patients improve, their condition is apparently distinctly ameliorated, and the course of their tumors considerably retarded. Thus much can, I believe, often be done even in the hopeless cases of carcinoma in the cavities of the body.

In all of the foregoing I have suggested that operation is preferable to the use of X-rays in operable carcinoma. From this I would except epithelioma. I am ready to maintain that the results in epitheliomas treated with X-rays are as radical as those treated by operation, excepting always epitheliomas where the contiguous glands should be removed. And there are certain features of the treatment of epitheliomas with X-rays, such as the freedom from pain for the patient, the more satisfactory character of the scars, and the greater range of usefulness, which, in my opinion, entitles X-rays to be regarded as the preferable method of treatment of most epitheliomas.

In advocating the use of X-rays in the treatment of epitheliomas, and in the treatment of inoperable carcinomas, consideration should be given to the question first, "Is the danger of metastases in epitheliomas increased by the use of X-rays?" and, second, "Is there danger of stimulating and rendering more rapid the growth in inoperable carcinoma by the use of X-rays?" I believe that both questions can be positively answered in the negative. In the first place, the histological findings are not such as lend plausibility to the first of these questions. In carcinoma tissue exposed to X-rays there is not first a stimulation of the growth; on the contrary, the first thing that is noted is a degeneration and a disintegration of the youngest peripheral cells. The vitality of the cells is lowered, their nuclei are converted into fragments, the protoplasm degenerates, and stains poorly; the whole process is one of disintegration rather than of even temporary stimulation of the carcinoma cells. If there is an organism of carcinoma in these cells, it might be liberated in this process; but certainly any organism which might be so liberated would have already had the opportunity of invading other tissues; and the whole course of carcinoma shows that the danger of metastases arises, not from the presence in the circulation of organisms which may lodge, but from the floating away and lodgement at other points of living carcinoma cells, and after X-rays liberate carcinoma cells they are in no condition to proliferate. My experience certainly has given no plausibility

to either of these suppositions of danger. If the danger of metastasis were increased by the treatment with X-rays, it should show in any large lists of epitheliomas treated by this method. I have had this point closely in mind. I have never seen a metastasis develop while an epithelioma was under treatment with X-rays, or afterwards, unless there was every reason to believe that metastasis was present at the time the treatment was begun. On the contrary, I have seen metastases escape on removal many times when there was much reason for them to be feared.

As to X-rays stimulating the growth of carcinomas which they cannot cure, I have seen no cases which lend weight to this hypothesis. On the contrary, I have had many cases in which the amelioration of the condition during X-ray exposures was explained away by calling attention to how frequently these cases did better than was to be expected.

BROWN ATROPHY OF THE HEART AS A RESULT OF CHOLECYSTITIS AND AS A COMPLICATION OF CHOLECYSTECTOMY.[1]

BY BAYARD HOLMES, M.D.,
OF CHICAGO.

In the progress of surgery into the domain of internal medicine no advance has offered more brilliant results than the surgery of the biliary tracts. There are, however, mysterious dangers connected with operations upon these patients which have so far defied either prognostic diagnosis on the one hand or pathologic interpretation on the other. In operations upon the biliary tract the fear of cholæmia, of hæmorrhage, of complete suppression of urine, and of unmeasurable shock, deter experienced operators from a too sanguine prognosis and a too impetuous surgical interference.

A number of unexpected deaths have occurred after cholecystectomy and other rather brief operations upon the biliary tract in which the necropsy has failed to show any gross pathologic lesion other than the changes in the heart and large blood-vessels incident to any protracted toxæmia. It has been my misfortune to meet one such unexpected issue in a cholecystectomy on a young woman where I believed myself warranted in making a most favorable prognosis. My experience in cholecystitis had called my attention sharply to the relation between this disease and easily recognized secondary disease of the heart, but no previous instance had occurred in my practice calling my attention to the result of the very serious toxæmia which the following case most tragically portrays.

Mrs. C., thirty-two years old, had a perfectly clear and unrelated family history, except, perhaps, the fact that her mother died of biliary disease. She had no serious sickness as a girl.

[1] Read before the Chicago Surgical Society, May 1, 1905.

Her menstruation began early, but was scanty. She always had a good digestion, was extremely active, and weighed ordinarily 136 pounds. Eight years ago she suffered of a protracted, painful disease of her left knee. This kept her off from her feet for several months. It was slow and insidious in its onset, only moderately painful, and produced a contraction and flexion of the knee, which disappeared only after several months on crutches and a long course of massage and other treatment. She never had a typhoid or any other febrile or septic condition; but four years ago she had a sickness which was called the grippe. It never confined her to bed, but it materially interfered with her health. She has been married four years, and has never been pregnant nor suffered of any vaginitis or endometritis. Occasionally during the past eight years she has had frequent attacks of stomach trouble, and during the past three and a half years she has had severe abdominal pains terminating usually in vomiting. These attacks have been so severe as to require the use of large doses of morphine, and they have come on so suddenly as to interrupt a railway journey. Her digestion has been poor in the intervals between the attacks, and she has spent several months at water-cures and in the South in search of health. She has very gradually lost considerable weight, estimated at twenty or thirty pounds, and has become weak, irritable, fretful, and somewhat hysterical. Only twice during the past few years has she been moderately jaundiced for a day or two after a paroxysm.

She appeared to be an animated, high-strung, slightly cachectic woman, rather spare, weighing scarcely 100 pounds, but active, alert, and irritable. She appeared slightly anæmic, and her blood count stood at 4,600,000 red corpuscles, 7400 white corpuscles, and a high hæmoglobin index. Her conjunctivæ were slightly yellow, and the blood-vessels were dilated and tortuous, as she said from retching and vomiting. Under her lower lid were dark lines from the same cause. The gums and teeth were in perfect condition, but slightly retracted and pale, with no blue line. The lymph glands in the back of the neck, at the elbows, axillæ, and groin were not palpable, except in the left groin above the affected knee a diffuse packet was easily felt. The lungs appeared perfectly normal to percussion and auscultation. The area of cardiac dulness was normal, with the apex beat in the fifth interspace three and a half inches from the mid-line. The heart sounds were regular and without murmur or noticeable accent. The area

of hepatic dulness began at the fourth interspace and extended to the border of the ribs in the mammary line and normally elsewhere. On deep inspiration the region of the gall-bladder was excessively tender, but otherwise there was no tenderness anywhere over the abdomen. There was no visible or palpable tumor. The stomach extended to a line an inch above the umbilicus. There was no splashing sound. The navel was not retracted and contained no enlarged lymph-glands. The right rectus was distinctly more tense than the left. A pelvic examination disclosed no abnormality. The cervix was small, hard, and showed no sign of present or past pregnancy. An examination of the urine developed nothing pathologic. Its specific gravity was 1024, acid reaction, 1.3 per cent. of urea, no abnormal constituent, no microscopic elements except a few leucocytes.

The attacks of biliary colic were so severe, so frequent, and produced such digestive and nutritive disturbances, that I advised cholecystectomy. After a few weeks the patient returned for operation, and the routine examinations of the hospital confirmed the previous findings and established the previous indications.

After being prepared for operation by a single day's stay in bed she was operated upon under gas and ether anæsthesia. The upper half of the Bevan incision three and a half inches long was made, and the gall-bladder brought into the wound. It was thick, white, and evidently diseased. It was so distended with its content that no hard bodies could be positively palpated. It was therefore opened and the stones to the number of a hundred or more, two of which were large and S-shaped, each of them three-quarters of an inch long, were removed. After wiping out the gall-bladder no bile appeared, and a cholecystectomy was undertaken. The cystic duct was separated from the liver with a blunt instrument, and the finger passed under the duct. A curved artery forceps was then carefully applied over the finger so as to include all the tissues in the cystic duct. A second artery forceps was applied ventrally and the duct cut off between them. The gall-bladder was quickly removed, and on account of the immobility of the liver and the desire to make the operation as short as possible, no attempt was made to cover the denuded surfaces with peritoneum. An iodoform gauze drain was passed down to the cystic duct, covering the fissure, and coming out of the wound by the side of the artery forceps. The rest of the abdominal wound was quickly closed. The operation lasted thirty-eight

minutes, including scrubbing and dressing. The condition of the patient at the end of the operation appeared to be excellent.

The nurse's record shows that her pulse when she was placed in bed was 104, her temperature 97.5° F., and her respirations, 18.

She was given one-fourth grain of morphine hypodermically at 5.15 P.M., at which time her pulse was 98, her temperature 97.5° F., and her respirations 24. She voided six ounces of urine, which was sent to the laboratory. At 9 o'clock she was nauseated, and her pulse rose to 108. Her condition was reported to me, and I ordered the dressings removed to look for hæmorrhage. At 10 o'clock she began to show cyanosis, and her pulse was 118, her respirations 30, and her temperature 97.6° F. She was delirious, and died twenty-five minutes later, greatly cyanotic.

The complete necropsical report was made by Professor Zeit from the examination of the principal material and the report of Dr. Kohler, from which it is enough to say that there was no evidence of hæmorrhage or infection in or about the wound. The omentum extended to the pubes in the median line, while in the region of the gall-bladder it was retracted and somewhat injected. The transverse colon, cæcum, and urinary bladder were all distended. The appendix was 8 centimetres long and extended into the pelvis, but it was without adhesion. The stomach extended a hand's-breadth below the xyphoid cartilage. The liver did not extend below the costal arch. The gall-bladder was absent. The pylorus was thickened and bound by adhesions to the transverse colon. There were no blood-clots or bile stains in the region of the gall-bladder, but the surrounding structures were red. The small intestines were collapsed, except the duodenum. The right pleural cavity was free and without adhesions. The left was bound to the diaphragm over nearly its whole extent. The thymus gland was small and firm. The pericardium was smooth, glistening, and contained a small amount of clear fluid. The heart weighed 230 grammes; the surface was smooth, and showed more than the normal amount of fat over the right ventricle. A section showed the characteristic color and markings of brown atrophy. The aorta and all its larger branches and the coronary arteries were studded with atheroma. The atheroma completely surrounded the orifices of both coronaries. The lungs were without thrombi. The spleen weighed 225 grammes; the pulp was prominent and the capsule wrinkled. The kidneys weighed 115

and 125 grammes respectively; the capsule stripped with difficulty; the cortex was as ½ to 2. The liver weighed 1360 grammes; its consistency was flabby, its markings normal.

The anatomical diagnosis as made by Professor Zeit was cholecystectomy, brown atrophy of the heart, atheroma of both coronary arteries and the large blood-vessels, chronic diffuse nephritis, interstitial type, slight splenic tumor, chronic interstitial oöphoritis, with hydrops folliculi, hyperæmia of the pancreas.

I am accustomed to provide against every possible danger by a careful study of the patient over a considerable period immediately before any surgical procedure where an emergency does not exist. In this instance this was not done. She did not remain in the hospital long enough before the operation. She was not built up sufficiently after her last attack of colic. The urinalyses were not made promptly enough after the urine was passed. Even though she was only thirty-two years old and had perfectly soft radial arteries, it is likely that repeated examinations of her blood-pressure would have suggested atheroma. It is possible that had I observed her during one of her colics the heart's action might have suggested angina. It seems strange that casts were not observed at any of the examinations. They were doubtless present, and while their presence would not have deterred me from cholecystectomy, they would have materially modified my prognosis, though they could not have increased my care during the operation nor modified my judgment of its necessity. It is possible that a more expert diagnostician would have recognized something suggestive in the heart sounds, but the case seemed so clear and uncomplicated that I relied entirely upon myself and my assistants. In any case I consider it my duty to call the attention of the profession to the possibility of a change in the heart and the larger blood-vessels due to sepsis, incident to cholecystitis, or the infection of the other natural cavities of the body, the sinuses of the head and face, the pelves and calyces of the kidneys, the appendix, the tubes, and the posterior urethra.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 11, 1905.

The President, Dr. Howard Lilienthal, in the chair.

PLASTIC OPERATION FOR ENTIRELY NEW LOWER LIP.

Dr. Robert H. M. Dawbarn presented a man, 55 years old, who was operated on for an extensive epithelioma of the lower lip. The disease had symmetrically involved both sides of the lip, and the induration extended almost a centimetre beyond the angle of the mouth on either side. It was necessary, therefore, in order to correct the defect, to supply tissue amounting to one and one-half times the size of the lower lip, and this had been done with a result that was almost perfect, together with an excellent vermilion border.

The case was shown to illustrate the superiority of the Dowd modification of the original Malgaigne plastic operation for restoration of the lower lip. In the Malgaigne operation, two nearly parallel and almost horizontal incisions were made, the upper one running backwards from the angle of the mouth, and the other from a point the depth of the lip lower, but not extending further than the edge of the jaw bone; and in order to overcome the slack in the cheek, a triangle of tissue was removed from the extreme rear end of the upper horizontal line. Dowd, on the contrary, removes a triangle at the bottom of the groove running from the alæ nasi, so that its excision was not perceptible, whereas in Malgaigne's operation it was very much so. Another objection to the latter's method of operation was the liability in making this little triangle to cut Stenson's duct. Dowd carries his lower incision well beyond the end of the lower jaw, thus enabling him to clear out the submaxillary space, a point which should never be neglected in these cases.

In both of these operations, Dr. Dawbarn said, one did not at first cut entirely through the cheek into the mouth, along the upper line, but dissected up the mucous membrane sufficiently to form a vermilion border to the new lower lip.

PLASTIC OPERATIONS FOR EXSTROPHY OF THE BLADDER

Dr. B. Farquhar Curtis presented a boy, who was admitted to St. Luke's Hospital in November, 1900, with complete exstrophy of the bladder and epispadias. The patient was at that time 26 months old. There was no hernia; the skin was normal; there was a slight diastasis of the pubic bones. The boy was operated on November 20, 1900, by the Czerny method. The mucous membrane was dissected up on the upper and lateral margins, turned in, and sutured across the everted bladder, converting the latter into a cavity that was open from below. A bridge-flap left attached at both ends was cut on each side and slid towards the middle line, their inner borders being sutured together across the raw surface of the mucous membrane. The sutures in the mucous membrane did not hold, and the flaps separated in the middle line, but the area of exposed mucous membrane was much reduced.

On December 20, 1900, Thiersch's method was tried, two lateral bridge-flaps being dissected up and allowed to granulate. On January 29, 1901, one end of each flap was divided, and they were then sutured together across the bladder, the granulating surfaces being turned inward. Minor operations, such as freshening the edges and suturing, were done at intervals during the next six months, securing a covering for the upper two-thirds of the bladder. An attempt at covering the urethra was also made, resulting in obtaining a bridge of skin across it at the base of the penis, about a quarter of an inch wide.

On October 30, 1902, the redundant foreskin, hanging like an apron below the glans, as is usual in epispadias, was perforated by a scalpel in the middle of its base; through this opening the penis was drawn and the foreskin was then turned up over the lower part of the bladder, its inner surface being turned inward. Its edges were freshened and united by suture to the edges of the skin-flaps covering the upper part of the bladder. Several minor suturing operations were needed to close some gaps which formed, and to unite the lower border of the turned-up foreskin-flap to

the little bridge of skin across the base of the penis. This resulted in a complete covering of the bladder, with one pin-hole fistula remaining.

On September 7, 1905, the boy, now 7 years old, returned with a calculus almost filling the bladder cavity. This was removed by crushing. The small fistula still remained. The entrance to the bladder at the root of the penis admitted a 30° F. sound. The skin was healthy. The cavity of the bladder would hold from twelve to eighteen fluid drams. The penis was growing; the testes were normal.

Later on, Dr. Curtis said, an operation for the relief of the epispadias would probably enable him to fit a convenient urinal over the penis. With proper irrigation, he thought the formation of further calculi could be held in check.

Dr. Lilienthal said he could not recall a single case of exstrophy of the bladder where the patient's condition could be regarded as enviable even after the most favorable operative results. In a case that was shown at a meeting of the Surgical Section of the Academy last spring by Dr. Ramon Guiteras there was very great improvement after the operation, and the patient was able to hold about three ounces of urine. In that instance, the good result was apparently entirely due to the fact that for a time subsequent to the operation, ureteral catheters were kept *in situ,* thus preventing the parts from being constantly bathed in urine. Even in that case, however, the patient's condition was so far from normal that his state was not a happy one.

Dr. Lilienthal said that some years ago he had suggested the following operative procedure in dealing with these cases: Leaving the bladder alone, he would make an end-to-end anastomosis between the ileum and the first part of the ascending colon, and then, after thus completely excluding the cæcum and part of the colon, he would implant the ureters into it, and possibly make use of the appendix as a urethra, passing the appendix out at the external wound and twisting it to insure a sphincter-like closure. This method, he thought, would be preferable to Frank's operation of implanting the ureters into the rectum. If it was found impracticable to implant both the ureters into the cæcum, the right might suffice, subsequently removing the opposite kidney. The aseptic artificial bladder thus formed would be able to contain probably eight ounces of urine.

In the usual operation for exstrophy of the bladder, the danger of stone formation was always present, and there would probably be recurrence of that condition in the case shown by Dr. Curtis.

Dr. Curtis, in closing, said the best he could hope for in his case was to get complete union of the bladder to the penis, after the epispadias had been corrected. After repair of the urethra, the patient might be able to wear a urinal with some degree of comfort. He did not expect to get any muscular control over the bladder. These patients were in such a deplorable condition that it was absolutely necessary to attempt to do something for them.

ABSCESS OF LIVER (RECURRENT)

Dr. Charles H. Peck presented a man, 50 years old, a native of Austria, and a porter by occupation. He was admitted to Roosevelt Hospital May 22, 1905. He stated that five years ago he had been operated on at the German Hospital for abscess of the liver. The operation had resulted in complete recovery from his symptoms, and he had remained well (excepting for a slight ventral hernia in the cicatrix) until October, 1904, *i.e.*, about four and a half years. He then began to suffer from pain and increasing loss of flesh and strength. On admission, he was extremely weak and emaciated; his temperature was high; his pulse rapid and weak. There was marked pallor, and he perspired freely. The leucocyte count was 13,000. The liver was enlarged and sensitive, but no localized bulging could be made out. On May 26, the day prior to his transfer to the Surgical Division of the hospital, he seemed moribund and unable to bear any operative procedure. His temperature had ranged as high as 105°, with a pulse that could scarcely be counted. On the following day he was slightly stronger, and an operation was performed under a one per cent. cocaine analgesia. An incision was made through the thin wall of the hernia, close to the right costal margin, and the surface of the liver was exposed. Several punctures failed to find pus, but finally, by plunging the needle obliquely upward to a considerable depth in the right lobe, pus was withdrawn. Adhesions of the convex surface of the liver to the diaphragm were found at this point.

The abdominal incision was closed by suture and protected and a fresh incision made over the costal cartilages. Portions of the costal margin and of two cartilages were cut away, and the needle again thrust into the abscess through the diaphragm below the pleura. A grooved director followed by a slender dressing forceps was thrust into the liver alongside of the exploring needle, and from two to three pints of chocolate-colored pus evacuated. A large drainage tube was then inserted and a dressing applied. The operation had occupied thirty-five minutes, and at its conclusion the patient's condition was very poor. The abscess drained freely. The patient's temperature remained below 100° F. after the first day; the diarrhœa from which he had suffered gradually disappeared, and his condition improved steadily. The abdominal wound healed by first intention. The patient left the hospital on June 17, 1905, with a discharging sinus. He had continued to gain flesh and strength, but the sinus had not yet entirely closed. A culture made from the pus proved sterile.

DR. DAWBARN reported an almost exactly similar case that had come under his observation within the past year. The patient was a middle-aged woman who had been referred to him by Dr. Henry Moeller, of this city. The diagnosis rested between liver abscess and some solid growth, presumed to be a sarcoma. An operation revealed the presence of an abscess of the liver, from which a litre and a half of moderately offensive pus was withdrawn. It was examined by Prof. F. M. Jeffries, and proved to be amœboid in its nature. The origin of the infection could not be traced.

TYPHOID PERFORATION OF THE ILEUM; SUTURE.

DR. ALEXANDER B. JOHNSON showed two cases of this character. The first was that of a girl of 12 years, who first came under observation about a year ago. She had been a patient in the medical ward of the New York Hospital, having been admitted on October 5, 1904, and was apparently in the latter part of the third week of typhoid fever. The Widal reaction was positive, and her history was that of typhoid fever. The case progressed without incident until the afternoon of October 10, five days after admission, when about 4 o'clock she began to suffer severe pain in the abdomen, and had three attacks of vomiting

during the next four hours. Her temperature rapidly rose from 100.5° to 105° F., with a rapid and feeble pulse. Her leucocyte count, which had been about normal, suddenly increased within a few hours to 6900, with a relative increase of the polymorphonuclear cells.

The following morning, when Dr. Johnson saw the patient, her general condition was quite good, but her abdomen was extremely tender and somewhat rigid, especially so in the right lower quadrant. Her general symptoms had remained unchanged.

Operation 1.30 P.M., eighteen hours after the first symptom of perforation had occurred. At this time the patient's condition was not very good. She seemed to be suffering from acute sepsis, with a considerable degree of shock, and it was deemed advisable to do the operation in the most rapid manner possible. Upon opening the abdomen, which he did through an oblique incision three inches long in the right iliac fossa, going directly through all the layers of the abdominal wall, he found a considerable quantity of intestinal contents free in the abdominal cavity, together with some pus. A perforation about three mm. in diameter was found in the ileum, about a foot from the cæcum. It was closed by a purse-string suture of No. 8 silk, reinforced by a number of mattress sutures of silk placed in the line of the long axis of the gut. The peritoneal cavity was then irrigated with a warm saline solution, and two rubber tubes with gauze wicks were inserted down to the perforation. The wound was then closed, excepting where the drain made its exit.

The operation was completed in fifteen minutes, and the patient reacted well. The temperature rapidly fell to normal, but, as was usual in these cases, it was followed by numerous rises, which were probably due to the typhoidal infection. The patient was discharged, cured, on November 17, thirty-seven days after the operation.

The second patient shown by Dr. Johnson was a man, 25 years old, who was under treatment at the New York Hospital for typhoid fever. On the forty-fourth day of his disease, when apparently convalescing, and after his temperature had been normal for a week, at 11 o'clock in the morning he was suddenly seized with a violent pain in the abdomen. The pain was at first general in character, but subsequently referred more especially to

the right lower quadrant of the abdomen. Three hours after the onset of his pain his temperature had risen to 102.8° and his pulse from 82 to 120. His leucocyte count, which previous to this time had been normal, rose to 12,000, with 82 per cent. of polymorphonuclear cells.

When Dr. Johnson saw the patient, at 8 o'clock that evening, he appeared to be in a fairly severe condition of shock. The pulse was 144 and weak. The temperature was elevated; the belly was flat, and quite painful. There was considerable rigidity on the right side, more marked in the lower right quadrant.

Operation September 6, at 8.35 P.M. The abdomen was opened by an intermuscular incision. The peritoneal cavity contained a considerable quantity of thin, sero-purulent fluid, but no pus. A perforation of the ileum was found about six inches from the cæcum, and as the ileum was withdrawn through the abdominal wound it burst, and there was a squirt of intestinal contents. The Peyer's patch and the surface of the intestine were coated with fibrin, and apparently adhesions had formed to such an extent that very little, if any, of the intestinal contents had previously escaped. Irrigation was therefore considered unnecessary. The perforation was closed as in the previous case, and a small cigarette drain inserted. The operation was completed in twenty minutes, and the patient made a normal convalescence.

DR. CURTIS asked Dr. Johnson why, in these cases, he preferred the lateral incision to the median one? Personally, he preferred the intermuscular incision whenever possible, but he would rather hesitate to resort to it in cases of this character because it was so small that it might prevent the thorough toilet of the peritoneal cavity.

DR. JOHNSON, in reply to Dr. Curtis, said he had no definite reason for making the incision as he did, excepting that in all cases of that kind that he had operated on the perforation was quite readily reached by finding the cæcum and pulling out the ileum. It seemed to be a perfectly satisfactory and convenient way of getting at the ileum, and he thought it helped expedite the operation. In the case of the little girl, the patient was on the table only ten minutes.

DR. DAWBARN remarked upon two points mentioned by Dr. Johnson: First, that the perforations were closed by a purse-string suture reinforced by mattress sutures; and second, that

catgut was used in one case and silk in the other. Dr. Dawbarn said that so far as he knew, he originated the purse-string suture for roundish holes in the bowel, and he never has known of an instance of this kind nor in appendix work where it was necessary to reinforce the single purse-string suture. By leaving out the mattress sutures in the cases reported by Dr. Johnson, several minutes might have been saved, and time, in operations of this character, was a most important factor. In a discussion of this subject at a meeting of the Surgical Society ten years or more ago, Dr. John A. Wyeth had told Dr. Dawbarn, who chanced not to have been present, that he and all the other members then present had agreed in favor of the interrupted suture, their objection to the continuous suture being that after the belly was closed, and peristalsis being promptly renewed, one of the continuous sutures might tear out as the result of that peristaltic action, hence permitting leakage by a gaping of the whole wound. Dr. Dawbarn said he prevented such an accident by quieting the intestines with morphine—using the "morphine splint." Upon this point the real safety of continuous gut-suturing depends. And as compared with any interrupted plan it is a great time-saver.

In regard to catgut, the speaker said he would prefer never to use it in gut work unless it was both very fine and chromicized, as he feared that the activity of the peritoneal secretions might cause it to become absorbed too soon. The proper suture material, as demonstrated many years ago by Dr. Willy Meyer, was linen, silk or cotton, which was so well tolerated in the bowel wall. And since linen is the strongest, size for size, and is not weakened by boiling, as silk is, it seemed to Dr. Dawbarn that we have in surgery no good reason for using silk or cotton,—except where we cannot procure linen thread of the desired size.

Dr. Lilienthal said that in dealing with an emergency like that in the two cases reported by Dr. Johnson, the operator should have a well-defined idea of his method of procedure, and the speaker thought there was every reason for preferring a lateral incision to a median one. The incision he resorted to in these cases was through the outer part of the rectus, the same as that through which he removed the appendix. The advantage of the lateral incision was that through it one could easily reach that part of the ileum which was almost invariably, if not invariably, the seat of the perforation. From four to six feet of the ileum

could be drawn out through such an incision and carefully examined, which should always be done, as multiple perforations might be present. Cases were on record in which there were perforations or threatened perforations in the cæcum and neighboring colon, and those could not be readily reached through a median incision. The speaker said he had operated on five of these cases of perforation of the ileum, and in every instance the operation was speedily completed through the incision in the right rectus. In chronic cases, with abscess, the incision should be determined by the probable site of the lesion.

In Dr. Johnson's first case, the operation was done eighteen hours after the onset of the symptoms of perforation, and no adhesions were found. That fact, the speaker said, was an indication that the infection was purely typhoidal and not mixed in character, as with the latter type adhesions rapidly formed. The former class of cases were the most favorable.

In regard to the early diagnosis of typhoid perforation, Dr. Lilienthal said the medical men still needed some training. They should not wait for a sudden drop in the patient's temperature, but rather for a sudden rise, accompanied by pain in the belly. In any case where there was a probability or even possibility that a perforation might occur, notably in the case of abdominal distention, the surgeon should be kept within call.

Dr. Charles H. Peck said he had operated on three cases of typhoid perforation during the past summer. In all the cases the perforation had occurred during the heighth of the fever, before the end of the third week. All three were operated on within five hours after the onset of the symptoms of perforation, and one of them within two hours. All three cases resulted fatally. The incision made was that known as the Kammerer incision, near the outer border of the right rectus, and the perforation was located without difficulty. The duration of the operation in one case was about twelve minutes; in the others eighteen and twenty-five minutes, respectively. One of the patients lived for ten days after the operation; in the others there was no abatement of the typhoidal symptoms, and the patients died within three days after the operation. The speaker said that while he had seen the cæcum extensively involved in typhoid, he had never seen any perforations in that section of the gut.

Dr. Lilienthal said that even taking it for granted that

there were no perforations in the cæcum, that organ and the fixed part of the ileum could not be reached through a median incision without an undue amount of traction on the inflamed ileum.

DR. CURTIS said that an incision along the outer side of the rectus would answer the same purpose as a median one, as far as rapid closure of the wound was concerned. What he objected to was an oblique incision through the muscular structures.

EXCISION OF ASTRAGALUS AND TENDON GRAFTING IN CLUB-FOOT.

DR. ROBERT H. M. DAWBARN presented a young man of 20 who was operated on by Dr. Dawbarn at the Polyclinic Hospital on April 4 of this year. He was born with extreme equino-varus club-foot on the left side, and when eighteen months old had an attack of anterior poliomyelitis, with resulting permanent paralysis of all the group of muscles on the front of the leg—those supplied by the anterior tibial nerve. Dr. Dawbarn said that the result of the operation in this case, which was ideal, was practically identical with that in another adult case which he had showed here about two years ago, excepting that the latter case did not require tenoplasty.

The steps of the operation were as follows: First, the astragalus was excised through a semilunar incision curving below the external malleolus; next, through a semilunar incision, but on the inner side of the foot and ankle, about one-fourth of the thickness of the tendo Achillis was detached from its insertion and split up until the muscular portion of the gastrocnemius and soleus was reached; next, the remaining three-fourths of the tendo Achillis was divided opposite about the level of the tip of the inner malleolus to overcome the equinus part of the club-foot—the astragalus excision having overcome the varus, so that now, without any effort whatsoever, a normal position of the foot could be produced by the surgeon's hand. But, because the patient would upon recovery have stubbed along, being wholly unable to raise his toes, the extensive tendon grafting described below was done.

Making use of the non-paralyzed post-tibial nerve, the strip from the tendo Achillis already named was now brought forward well in front of the internal malleolus by a free dissection

of the skin-flap upon the instep and passed through a slit in the tibialis anticus tendon, and a second at right angles to the first slit. Through similar slits in the tendon of the extensor proprius hallicis, and finally, through that of the innermost one of the extensor tendons of the four lesser toes. At each of these pierced tendons the stout piece of tendo Achillis was secured by the finest chromicized catgut. The slits were so placed as to be highest in the tibialis anticus tendon, and a little lower in the others, in the order named, for obvious reasons.

Next, to make use of the non-paralyzed musculocutaneous nerve, through the incision from which the astragalus had been excised the peroneus brevis was severed at its insertion into the calcaneum. This, though a weak and slender tendon, was chosen, rather than the peroneus longus, because the latter, if divided, would have been bad surgery, tending by its absence toward a reproduction to some small degree of the varus. The peroneus brevis was carried well in front of the external malleolus by free skin dissection, and was passed through slits made in the tendons, (as already described) of the extensors of the outermost three toes.

Healing was secured under a single dressing. The space formerly occupied by the astragalus was filled by " Schede's moist blood clot," and upon removal of the plaster-of-Paris splint at the end of six weeks there was found a movable and painless false joint, as was regularly the case where asepsis was maintained.

With constant practise this patient could now not only walk with entire comfort and no trace of club-foot, but he could for the first time in his life move his toes, and that freely. Because of the poliomyelitis in infancy, the affected limb was somewhat shorter than its fellow; otherwise, no limping whatever would be observable.

Dr. Dawbarn added that in his opinion, in extreme cases of this type of club-foot, after infancy, the operation of astragalus excision plus tendo Achillis section was far preferable and more in accordance with good surgical principles than the foot-crushing and moulding methods, such as that employed by Dr. Lorenz.

Dr. Dawbarn reported, in conclusion, his only bad result by the method advocated. This was his first operation by this plan, in the person of a stout, middle-aged woman. After operating,

and while applying the plaster-of-Paris, the assistant was instructed to hold the foot in normal position and at right angles with the leg. Dr. Dawbarn neglected to observe that the weight of the leg caused it, unsupported, to drop back, so that the heel did not project backwards far enough—as the event showed—either for comfort in walking or for a good and normal appearance. Of course, this blunder is easily preventable, and is only mentioned as being the one most likely to spoil the outcome, next to a break in the chain of asepsis.

LATE SECONDARY CARCINOMA WITHOUT LOCAL RECURRENCE.

Dr. B. Farquhar Curtis read a paper with the above title.

Dr. Charles N. Dowd said that among his cases of carcinoma of the breast he had found the records of nine instances where metastases had occurred without local recurrence at fairly long periods after the operations. Three of these were in the spinal cord, three in the lung, two in the liver and one in the stomach. The longest period of immunity was five and a half years, while one of the metastases occurred within six months after the operation. The average time was about three years.

Dr. Dowd said he could indorse Dr. Curtis's statement in regard to the comparative comfort enjoyed by a patient with an internal metastasis as contrasted with the suffering caused by a breast cancer. The suffering caused by metastases in the lung or liver or stomach was far less than that produced by ulcerating masses in the breast or upon the adjacent chest wall. The patients with special growths, however, suffered severely.

Dr. John B. Walker mentioned three cases of carcinoma of the breast in which there had been late recurrences in other organs. In two of them the recurrences took place in the mediastinum, six and nine years, respectively, after the original operation. In the third case the recurrence was in the liver four years after the operation.

Dr. Dawbarn said that the first case upon which he had ever operated by the starvation method (excision of both external carotids), was one of round-celled sarcoma involving the nasopharynx. The operation was done about ten years ago, and up to the present time there had been no local recurrence, but the patient, as reported to him, had recently developed a swelling

in the abdomen which was possibly malignant. The original lesion still remained as a shrunken, hard mass, and the question arose whether this was a metastasis, in spite of the shrunken, inactive condition of the original lesion, or whether it was entirely *de novo,* like the first.

Dr. Dawbarn said that at the recent meeting of the Medical Association of the State of Pennsylvania he met Dr. Laplace, of Philadelphia, who had informed him that he had but recently returned from Paris, where he had seen Professor Doyen, of the Paris Ecole de Medicine, operate upon more than one case of ineradicable cancer of the tongue by excision of both carotids; and he had informed Dr. Laplace that the French surgeons were now using that method a good deal, having found that immediately after its use, and while the malignant growth was almost devitalized from starvation, X-ray and radium treatment and also serum therapy, either locally or otherwise, proved more efficacious than at other times, because the growth could then not oppose the treatment. This corresponds with the now recognized fact that radium acts best upon malignant growths when these are placed in regions comparatively devoid of vascularity.

Dr. Lilienthal said that Dr. Curtis had made the statement, in comparing tuberculosis and cancer, that the earlier and more complete the operation in both of these conditions, the better were the chances of a cure. Dr. Lilienthal said he inferred from that statement that Dr. Curtis favored the early surgical treatment of tuberculosis whenever that was feasible. Such a view was rather against the more modern trend of thought in regard to the treatment of tuberculosis, which now favored hygienic measures, even in dealing with the operable cases, such as tuberculosis in the joints of children, etc. The fact should not be lost sight of that operations in tuberculosis were not devoid of danger of spreading the disease.

Dr. Curtis, in closing, said he had simply made the comparison with tuberculosis because that was one of the fields of surgical work in which it was seldom possible to effect a complete anatomical removal of all the diseased tissue, and yet, in spite of that fact, operations on such patients were often followed by a permanent cure. Personally, the speaker said, he believed that operation gave the best results in certain cases of tuberculosis, particularly in adults.

SURGICAL PROGRESS.

I. Closure of Traumatic Defects in the Skull. A. STIEDA, of Halle, reported the method of treatment in complicated fractures of the skull and in cranial defects following injury, as employed in the surgical clinic of von Bramann. They aim to close the defect in the skull at as early a date, and as complete as possible, because a large defect is in every sense of the word a *locus minoris resistentiæ*. He reported the cases of injuries of the skull from April 1, 1897, to April 1, 1904. In thirty-three of forty-eight cases the particles of bone removed during the exposure of the fracture, or portions of the external table from the immediate vicinity, were implanted. All of these cases showed an exceedingly favorable result. Ten had no symptoms whatsoever; three complained of occasional headache; one suffered from vertigo, and the last case was that of a paralytic patient. Five patients, in whom it was impossible to replace all of the skull, suffered from disturbances. These consisted of headache, spots before the eyes, tinnitus, attacks of vertigo, etc. Of five patients, in whom sterilized bone chips were implanted, eight to ten days after the injury, four had symptoms, such as headache and occasional attacks of vertigo. Of eight cases treated through osteoplastic resection of the skull to cover the defect, six were according to the method of Müller-Koenig, and one to that of Seydel (taking a portion of the cortex of the tibia to cover the defect.) One of these cases suffered from epilepsy; five of the remainder had absolutely no symptoms. In two of these cases an osteoplastic operation had been carried out on account of an existing epilepsy, and there had been no recurrence after a period of four and a half and one and a half years respectively.

Stieda believes that an effort should be made, as soon as possible after the injury, to close the traumatic defect by bone, according to one of two methods: *first*, primary implantation and closure of scalp wound, if the area is aseptic, and can be kept so; *second*, if the wound is healed, he recommends excision of the scar, an osteoplastic operation according to Müller-Koenig, with skin, periosteum, and bone flap, or periosteum and bone flap alone, before an epileptiform or spasmophile change in the brain has taken place.

FRIEDRICH, of Greifswald, laid stress upon the fact that such a large percentage of cases of genuine epilepsy followed injury, although he admitted that in a great number of cases in which evidences of injury could be found after shaving the head, it was doubtful whether they had anything to do with the epilepsy. He emphasized the fact that the majority of writers now believe that the primary irritation for the epileptic attack is to be found in the cortex. This is the only way in which one can explain why the influence of operation is such a beneficial one even in cases of genuine epilepsy. He brought out the fact, also, that it was well recognized that epileptic conditions, which were primarily due to injury, can pass over into those of genuine epilepsy, and for that reason a large percentage of cases of genuine epilepsy were primarily of traumatic origin. Of course, one must take into consideration that in many cases there was a predisposition on the part of the brain to the development of the epilepsy, as occurs especially through neuropathic heredity. He would like to see every case of genuine epilepsy investigated as to its traumatic origin, and a careful record kept of the symptoms, aura, condition of the patient in the interval, and the subjective sensations, in order to ascertain, as near as possible, from which area of the cortex the attack has originated. Such information is of great value from an operative stand-point. He would not advise operating on every case of genuine epilepsy, but he believes that here and there painstaking observation will find a case among

even these patients whose history and symptoms form an indication for operative interference.

As regards the technique, he has adopted the suggestion of Kocher, to make a large trephine opening and excise the dura. He has never drained the ventricles, and his trephine opening is usually larger than that of Kocher. If the symptoms lead him to suspect a spot in the skull in which there had been an injury, he, of course, trephined at this place, otherwise his trephine opening was always placed at the posterior end of the right frontal convolutions. Of the eleven cases which he operated upon, three are of special interest. In one case the clinical picture was that of a very severe epilepsy accompanied by idiocy. This patient had never had any attacks again, and his psychical condition was almost incredibly improved. The epileptic condition had existed thirteen years before the operation. The second patient has so markedly improved that he has been able to engage in an occupation in which there is great mental strain, and a third patient has been able to pursue a scientific career with success. Even three of the most discouraging cases of genuine epilepsy, with psychical changes, such as idiocy, have been influenced, so that in two of the cases the old clinical picture did not recur for months after the operation. A third case remained free from attacks for one year, but there was an unfavorable change in the psychical condition. The remainder of the cases are reported in detail in the original article.

H. KÜMMELL, of Hamburg, in the discussion stated that his permanent results were not so favorable as those of Friedrich. Shortly after the operation the condition was very encouraging. The attacks ceased for almost a year. In only one case (and that was a seven-year-old boy) was there complete recovery.—*Proceedings of the German Surgical Congress, 1905.*

II. The Operative Treatment of Purulent Meningitis. By DR. H. KÜMMELL, of Hamburg. This disease has been subjected

to operation in but three cases and recovery has been very rare. The circumscribed form which frequently accompanies middle ear disease has been operated upon a number of times with excellent results. Kümmell himself has had three cases of circumscribed purulent meningitis following middle ear disease which he operated upon through a large opening in the skull. All of these recovered. But in a number of cases similarly treated death ensued in spite of operation. He has carried out a similar method in a number of cases of tubercular meningitis without any recoveries, but the operation has had a favorable influence on the severe headaches and temperature. He also operated upon two cases of purulent meningitis, one following a fracture at the base of the skull and the other an ascending meningitis following an operation on the spinal canal. In the former case the lumbar puncture showed thick pus under great pressure. The patient was a man thirty-three years of age, and was admitted to the hospital ten days after the injury, deeply comatose and almost pulseless. A trephine opening was made through the skull over both parietal bones and strips of gauze inserted deeply towards the base of the skull. He improved gradually from day to day. Lumbar puncture on the third day showed only slightly turbid fluid. On the sixth day it was quite clear. There was transient aphasia and agraphia. The patient was discharged from the hospital after four weeks, fully recovered and able to work. In the second case following the operation on the spinal canal there was improvement in the symptoms, the coma and pain disappearing, but the patient died a little later.—*Proceedings of the German Surgical Congress, 1905.*

III. Intraneural Injections of Antitoxin in the Treatment of Tetanus. Professor Küster (of Marburg) reported a case of local tetanus with injection of antitoxin into the nerves and recovery. Gumpretcht was the first to call attention that the tetanus toxins reached the central nervous system through the

peripheral nerves, and Meyer and Ransom have found that one can block these nerves, and in that way protect the spinal cord. Küster had occasion to prove the correctness of this theory on a thirty-seven-year-old employee of the von Behring Institute. This patient had sustained a cut of the right hand on the palm while carrying a beaker containing virulent tetanus bacilli, the beaker breaking, and the fluid entering the cut. The wound was washed with tetanus antitoxin and a subcutaneous injection given. Beginning with the seventh day after the receipt of the injury, the patient had very painful muscular spasms in the right arm, followed by a similar condition in the muscles of the neck, jaw, and œsophagus. Küster exposed the axillary nerves and injected the antitoxin of tetanus into the median, ulnar, and musculospiral nerves until they began to show considerable swelling. He carried out the same procedure on the cervical nerves above the clavicle. The very next day the spasms entirely disappeared and never returned, but a very painful and long-continued myositis developed within a few days, which Küster did not ascribe to the injection. A perfect recovery ensued. He does not believe that the appearance of symptoms which indicate the involvement of the spinal cord are contraindications to its application, for the reason that the system can take care of all the toxins that have been absorbed, provided that the nerves are blocked so that no more can enter the system.

HERTLE, of Graz, in the discussion reported a case of tetanus which he had treated in a similar manner in September, 1904. The patient was admitted to the hospital on the third day after the appearance of symptoms. The wound was excised and tetanus antitoxin was injected into the wound and into the three principal nerves of the arm. At first there was considerable improvement, but after a lapse of six days the patient suddenly became worse and died within a few hours. He believes that the injections should be repeated a number of times.

BRAUN, of Gottingen, did not consider that the applications were of any benefit when the tetanic symptoms had become gen-

eralized. If the disease had existed ten days, one should not expect any results from the injections.

KOCHER, of Bern, reported one case in which recovery followed the use of the injection. He was very favorably impressed with the method, but did not believe that we ought to expect too much. The antitoxin was in all probability only able to utilize the toxins in the peripheral nerves into which it was injected.

Küster, in closing the discussion, said that we should limit the use of the method to the first days after the appearance of the symptoms, and advised using it as early as possible.—*Proceedings of the German Surgical Congress, 1905.*

IV. Present Status of Spinal Anæsthesia. By PROFESSOR AUGUST BIER (of Bonn). The old method of spinal anæsthesia with pure cocaine was not a competitor of general anæsthesia on account of its dangers and its unpleasant after-effects. The older substitutes of cocaine did not relieve this condition. A change has taken place, first, through the addition of suprarenal preparations, the best of which are paranephrin and suprarenin. These limit the dangers of cocaine considerably, but unfortunately they do not obviate the disagreeable accompanying and after-effects which cocaine causes, such as headache, backache, and vomiting. Second, stovain has been substituted for cocaine. It was first discovered by the French chemist, Fourneau. Compared with cocaine, it has very insignificant after-effects. Bier considers stovain the best agent to use at the present time for spinal anæsthesia, but advises that it should always be used in connection with adrenal preparations.

The great advantage of spinal anæsthesia is that it is excellently borne by weak persons and those who have endured a good deal of suffering, as well as by the aged. Formerly, it was impossible to secure the necessary anæsthesia after the introduction of the anæsthetic agent through lumbar puncture in about 6 to 10 per cent. of the cases. This can be reduced almost to nothing through painstaking technique.

V. CZERNY, of Heidelberg, after discontinuing the use of cocaine, began to use stovain, and has been very well satisfied with the results. The lumbar puncture should be made between the second and third lumbar vertebræ, about half a syringeful of the spinal fluid aspirated, and then 0.06 milligrammes of a 10 per cent. solution of stovain injected.

A. HERMES, of Berlin, reported ninety cases operated on by Sonnenberg, of which twenty-two were laparotomies. Four times it was impossible to obtain any anæsthesia. He considers this more of a matter of individuals, as it happened twice in the same individual. In abdominal operations a cold, clammy sweat occurred a number of times, accompanied by pallor and small pulse, so that it was necessary in one case to give camphor. Headache was a frequent after-effect, in one case lasting eight days, and in another eight weeks. The doses varied from 0.04 to 0.06 of stovain. He considers that the best indication for the application of spinal anæsthesia is in patients who are seventy-five or above, in spite of cardiac or pulmonary disease.

SILBERMARK, of Vienna, had operated 300 cases under spinal anæsthesia. His observations lead him to believe that the decrepit, emaciated individuals bear the method better than young, vigorous persons. He considers the method without danger if tropacocaine or eucain or stovain is used. He employs the sitting position of the patient, never elevates the pelvis. Anæsthesia failed to show in about 4 per cent. of the cases. Of these, one was after the use of stovain. He believes this is due more to errors in technique than to anything else. In 200 cases he allowed from 3 to 4 cubic centimetres of the spinal fluid to escape. In spite of this, over 20 per cent. had symptoms of a bulbar nature, such as vomiting, etc., during the operation. Since that time he only withdraws about 1 cubic centimetre of the spinal fluid and injects only 2 cubic centimetres of the anæsthetizing fluid, since which the cerebral symptoms are very rare. He believes that the withdrawal of much spinal fluid causes a lowered amount of pressure in the spinal canal, and as a result of this the

anæsthetizing liquid is rapidly carried to the medulla, causing bulbar symptoms. If the pressure is not lowered, the anæsthetic remains at the point at which it was injected, and is fully absorbed in the immediate vicinity of the puncture.

F. NEUGEBAUER reported 480 cases of spinal anæsthesia. The majority of these were carried out by the use of tropacocaine, but eucain, stovain, and tropacocaine were also used in gelatin. He has never observed any alarming symptoms nor any serious after-effects. Tropacocaine gave the best results, although it was followed by headache in 30 per cent. of the cases. His observations have taught him that eucain and stovain caused headache and vomiting much more frequently than tropacocaine. The suggestion of Klapp, that the anæsthetic substances should be injected, dissolved in media which permit only of slow absorption, such as gelatin, seems to hold forth great promise for the future. Anæsthesia begins in the perineum, extends to the posterior, and then to the anterior aspects of the extremities, and finally to the inguinal region. He would exclude laparotomies from this method of anæsthesia altogether, since larger doses are required, and there is more danger of intoxication.

PREINDLSBERGER, of Sarajewo, has performed spinal anæsthesia in 305 cases. He gave up using cocaine on account of some unpleasant experiences. He only uses spinal anæsthesia in operations from the lower abdominal regions down, such as herniotomies, operations on the urinary organs, on the rectum, and lower extremities. Out of 260 cases the anæsthesia failed to show itself in nineteen. In fourteen it was necessary to administer light general anæsthesia in addition, and in four, on account of the restlessness of the patient, it was necessary to use a general anæsthetic.

Concerning bad effects, he observed a severe collapse which rapidly disappeared in one case; six times mild collapse, with symptoms such as pallor, feeling of faintness, sweating, and small pulse, and in five cases rise of temperature as high as 105° F. The most frequent after-effect was headache. He used tropa-

cocaine in doses of 0.04 to 0.07. The patients were all injected while lying on the side, according to the method of Bier, and the pelvis slightly elevated after the injection. The solutions were sterilized in a water-bath, glass vials, and were again sterilized before using. He uses a metal syringe, which can be sterilized and taken apart completely.

AUGUST BIER, in closing the discussion, said that injections and operations in the Trendelenburg position should only be made when three drops of paranephrin solution have been added to the anæsthetic solution, otherwise collapse is to be feared. Failure of getting anæsthesia, such as reported by Czerny and Hermes, was to be ascribed to the faulty technique. He would advise not injecting while the spinal fluid is running off slowly, but while it was running rapidly. He does not use spinal anæsthesia for laparotomies. He did not consider spinal anæsthesia a fully perfected method. It was to be recommended for old, decrepit people, especially for operations upon the perineum and rectum. One could inject larger amounts of greater dilution, but there was always danger of collapse. He always permitted the patient to choose whether he wished to have the operation performed under spinal anæsthesia or under general.—*Proceedings of the German Surgical Congress, 1905.*

V. Permanent Results from the Operative Treatment of Basedow's Disease. DR. FRIEDHEIM, of Hamburg-Eppendorf, reported twenty cases of Basedow's disease which had been operated on by Kümmell, either by enucleation or resection of a portion of the goitre, or partial ligation of the afferent vessels. All of the cases had well-marked symptoms, such as exophthalmos, goitre, and palpitation, as well as marked emaciation, and the usual disturbances in the nervous system, respiratory and digestive apparatus. All the patients were women, and of the twenty operated on fourteen have fully recovered, and the interval which has elapsed between the operation and the last examination was ten to fifteen years in five cases, five to ten years in seven cases,

and four to four and a half years in two cases. Five have been improved through operation, and two of these, in which the operation was performed eleven and nine and a half years respectively, have not required the attention of a physician, and are able to pursue their occupations as fully as before the operation. In three cases there has been some improvement. The almost inseparable phenomena have not returned, but Basedow's symptoms are still quite marked, so that these patients were recommended to have another operation. One death occurred as the result of the operations. In this case there was a recurrence after the first operation. After the second operation the isthmus was only allowed to remain. The patient died ten days after the operation of tetanic symptoms. The operative successes confirm the theory of Möbius, that Basedow's disease is due to a morbid hyperactivity of the thyroid gland, and that this is the cause of the clinical symptoms. The most difficult and important point to decide at the time of the operation is just how much of the diseased thyroid to remove. If one is too radical, the result is the well-known strumapriva symptoms. If too little is removed, it will not help the malady. In all of the cases in which improvement alone occurs, one could still find some goitre, whereas this was not the case in those in whom there was permanent recovery, so he believes that, in the three patients in whom the result was not quite satisfactory, a second operation will result in recovery.

In 1900, Rehn had 30 per cent. of complete recoveries and a mortality of 22 per cent. Kümmell's cases show 70 per cent. recoveries and 5 per cent. mortality. When one considers that medication seldom leads to any permanent results, and that the mortality of the disease can be reckoned as 12 per cent., the indication for operative measures is well marked.

Kocher, of Bern, confirmed the observations of Kümmell and Friedheim, and believes that the results of surgical treatment is the best proof for the hyperthyroidization theories of the disease. If recurrence takes place, the operation should be repeated.

Genuine recovery can only be possible after operations, and not in a similar measure through internal means. Early operation gives the best results, and the mortality is due in a great measure to operating the cases too late. One should make accurate estimations of the blood-pressure.

VI. Pneumonia following Laparotomy. By DR. KELLING, of Dresden. Kelling considers as predisposing factors age, alcoholism, carcinomatous cachexia, cardiac exhaustion, emphysema, long-continued dorsal position, and nervous irritation (pain, vasomotor stasis, and chilling). Laparotomized patients are predisposed to pulmonary stasis, especially in the right lower lobe. The organisms find their way into the lungs in three ways: First, along the bronchial tract; second, through the blood; and, third, along the lymphatics. The first occurs through aspiration of the contents of the buccal and nasal cavities, of the œsophagus and stomach during vomiting. One of the most dangerous conditions is the bronchitis, on account of the aspiration of the sputum to other parts of the lung. Second, embolic pneumonias occur through formation of thrombi in the veins.

In some cases, for example, in the case of the uterus and of the stomach, the veins communicate directly with the vena cava, and in others the lymphatics of the vein walls communicate with those of the mesenteric vessels. The latter is the case in suppurative appendicitis and in strangulated hernias.

The third manner of infection occurs through the lymphatics: (*a*) Through the perforating lymphatics of the diaphragm into the pleura. A pneumonia is developed from a pleurisy when the pulmonary tissue becomes œdematous from stasis. (*b*) Through the blood-vessels of the diaphragm. In this manner sepsis occurs, with hypostatic pneumonia and lobular inflammations, and formation of thrombi in other portions of the venous system which are predisposed to it.

Kelling believes that air infection plays much more of a rôle after laparotomy than is ordinarily the case in wounds. The

chief factor in prophylaxis is to avoid infection of the parenchymatous organs, of the mesentery and of the free peritoneal cavity. Aside from aspiration pneumonia, the number of cases of postoperative pneumonia runs parallel with the percentage of infection.

In the discussion of this paper, CZERNY, of Heidelberg, reported 52 pneumonias in 1300 of his laparotomies. They are twice as frequent after the age of forty as before. Whether abuse of alcohol or tobacco plays any rôle is not certain. As regards sex, the percentage is equal, but occurs predominantly in obese people. In 4 cases the pneumonia was preceded by bronchitis; in 5 by emphysema; in 4 by cardiac weakness, and in 6 by pneumonia. The variety of anæsthetic seems to have no influence. Thirty followed chloroform; 11 chloroform and oxygen, and 3 Schleich's anæsthesia. Fifty per cent. of the cases were due to aspiration pneumonia. Aspiration after operation seems to be more frequent after wounds that have been sutured, on account of the severe pain which caused suppression of breathing and coughing. Fourteen of the operations were on the bile passages; 11 on the female genitalia; 12 gastro-enterostomies, and 12 resection of the stomach. Operations in the neighborhood of the diaphragm favor infection through limiting breathing. Operations in the upper portion of the abdomen constituted two-thirds of the total number. The right side is more frequently infected than the left. Appendicitis, which represented 14 per cent. of the total number of operations, constituted only 2 per cent. of the pneumonias. Twenty per cent. of pneumonias in gynæcological operations is quite striking, especially so as they only constituted 10 per cent. of the total number of operations. For lack of any other explanation, Czerny ascribes this to the Trendelenburg position. Of the 52 cases of pneumonia, 31 recovered, and 21 died in spite of primary union of the wounds. Croupous pneumonia occurred 12 times; gangrenous pneumonia 8 times; and 5 times there was pleurisy. Czerny considered as

very important to have the patient's buccal cavity and bronchial tract in as good condition as possible before the operation, and also to preserve the strictest asepsis during the time.

KÜMMELL, of Hamburg, was of the opinion that the anæsthetic played a great rôle, being especially frequent after ether, on account of the fact that the climate of Hamburg favors catarrh. Chloroform was used in 1754 of 2351 cases. Forty-three of these, that is 2.4 per cent., died of pneumonia. The average duration of the anæsthesia was forty to fifty minutes. The mixture of oxygen with chloroform seems to render the anæsthesia less dangerous. He has noticed a decided improvement since the use of five to eight decimilligrammes of scopolamine and one centigramme of morphine about an hour and a half before the anæsthetic. The scopolamine through drying up the secretions prevents their aspiration, so that even ether can be given after it. Since using this method, he has performed 409 laparotomies, with only 3 deaths due to pneumonia, *i.e.*, about five times less than before. He considers this combined anæsthesia a very humane one. He encourages his patients to breathe deeply as early as possible.

SCHLOFFER, of Innsbruck, reported the following table as the result of observations of embolic pulmonary complications in his clinic during the last year and a half:

No. of Cases.	Died.			Nature of Lesion in all of those Affected.	
	Total.	Pulmonary complications.	Embolic pulmonary complications.	Pulmonary complications.	Embolic pulmonary complications.
Total number of operations 1600	40	22	3	. .	. .
Goitre operations . . . 107	2	2	1	29	2
Laparotomies which include gangrenous herniæ 142	25	7	2	8	2
Herniotomies 403	. .	. .	. .	8 (70)	3

In 403 radical cures of hernia operations (non-strangulated), half of which were performed by Wölfler, and the other half by the Bassini, embolic pneumonia occurred three times, and always after Bassini operation. He would not state, however, that the formation and transportation of thrombi from the pampiniform plexus occurred more frequently after the Bassini than after the Wölfler. He was of the opinion, however, that the lesser degree of isolation of the vas deferens and the diminished liability of shaking of the cord through coughing spoke in favor of the Wölfler in this respect.

TRENDELENBURG, of Leipzig, was of the opinion that pneumonia followed all varieties of operation in about 1 per cent. of the cases, and laparotomies in 5 per cent. According to his observation, gastrostomies were complicated by pneumonia in 3 per cent.; gall-passage operations, 6.4 per cent.; severe contusion, 15 per cent.; appendicitis, 5 per cent.; exploratory laparotomy, 4.7 per cent. His own experience in regard to the frequency after the operations on the female genitalia was that it was only present in 2.8 per cent. of the cases, instead of the 10 per cent., as reported by Czerny. Of 85 patients who had pneumonia, 52 died, *i.e.*, 60 per cent.

FRANKE, of Brunswick, confirmed the opinion of Kelling that pneumonia sometimes occurs in epidemic forms in hospitals. It occurred so frequently in his experience several years ago that for a time he debated performing any laparotomy at all. He began medication as soon as there was the least suspicion of pneumonia, giving antipyretics, salicylates, and digitalis. If the cough was dry, he gave liquor ammonia anisatus. If the cough was very irritating, he gave codeine. Medicine can be given per rectum with equally good results.

KAUSCH, of Breslau, reported 1880 laparotomies from von Mikulicz's clinic, with 45 pneumonias, that is, 2.4 per cent., of whom 28 died, 1.4 per cent. He laid special stress upon prophylaxis, avoidance of chilling of the patient, wrapping up the limbs

well, irrigations with warm salt solution, having the bed well warmed, gastric lavage, especially before obstruction operation. Pneumonias are more frequent after operations close to the diaphragm than lower down in the abdominal cavity. The more frequent mode of transmission of the infection is in all probability along the lymphatics. He believes that ether is even less likely to be followed by pneumonia than other forms of anæsthesia. Their mode of procedure in laparotomies is to avoid local anæsthesia, and even the use of morphine and scopolamine. He did not believe in its occurring in an epidemic form.

FRIEDREICH, of Greifswald, laid special stress upon the lack of value of statistics, since those of Czerny and Trendelenburg differed so radically. A sharp distinction ought to be made according to the variety of pneumonia. He was of the same opinion as Czerny, that the majority of these cases were those of aspiration pneumonia; that croupous pneumonia ought not to come into these statistics at all, and the same was true of embolic pneumonias and of the hypostatic variety. He believes that the manner, the depth, and the duration of the anæsthesia play a great rôle in the etiology of the aspiration form; whereas the dyspnœa following operation plays an equally important rôle in the etiology of the hypostatic form. He believes that we can avoid many cases of hypostatic through the more liberal use of morphine to prevent the pain and the resultant suppression of breathing.

ROTTER, of Berlin, observed several cases of bronchitis, but never any pneumonia, in 200 scopolamine anæsthesias.

LENHARTZ, of Hamburg, believes that aspiration plays the principal rôle in the origin of pneumonias after anæsthesia, and recommends frequent change of position after the operation.

KRÖNLEIN, of Zurich, observed 8 cases of pneumonia in 1409 laparotomies. He has had entire years, for example, the year 1904, with 407 laparotomies, and no pneumonia. Attention to the minutest details is of the greatest importance. The anæs-

thesia should be as brief as possible, and as small an amount of ether of the very best quality used. All preparation of the patient is carried out before the anæsthetic is administered, and this greatly decreases the amount of ether used. The sponges used in the abdominal cavity are dry, except those which are utilized to hold the intestines aside, which are wet. He observes the strictest asepsis and as little manipulation as possible.

PAYR, of Graz, in order to confirm anatomically the transmission of infection from the peritoneal to the thoracic cavity, injected colored fluid into the central tendon of the diaphragm of dogs. After eighteen minutes some of them were killed. The carmine used was found in the lymphatics as high as the level of the bronchi. Seven minutes later it was found in the blood of the carotid artery.—*Proceedings of the German Surgical Congress, 1905.*

VII. Postoperative Prolapse of the Abdominal Viscera. By PROFESSOR MADELUNG (Strasburg). Very little reference to this in the text-books. Madelung collected 144 cases from the literature, and added 13 from his own and the practice of his colleagues. May follow laparotomy at any age or sex, and any in which even a simple exploratory laparotomy has been performed, as well as follow cases where large tumors have been extirpated. It follows especially incision in the lower half of the abdomen. It is not exclusively confined to incisions in the median line, but may happen after operation in which the incision has been made through the rectus, or even lateral to it. So far as Madelung could ascertain, it had never followed an operation upon the bile passages. He has observed it several times after enterostomy. It is especially likely to follow in cases where several laparotomies have been performed upon the same patient. The critical days are the eighth and ninth after the operation. He has collected 18 cases in which a laparotomy scar has given way. In one case five months, and in another even twelve years

after the laparotomy. The formation of a hernia did not precede this condition in every case. When a hernia was present, it seldom exceeded in size a fist or an apple. The results in these 18 cases was favorable, in spite of the eventration. The separation in the abdominal muscles is not always in the line of incision, but may be in its immediate vicinity. Almost every organ, excluding the pancreas and liver, has taken part in the prolapse. Escape of nine or ten feet of small or large intestine is not unusual, and even though they remain outside of the abdominal cavity for some time, they did not become inflamed. There is only a report of one case of mild symptoms of obstruction.

Undoubtedly the choice of suture material plays a rôle. Several cases occurred after the use of small-sized catgut, but observation of a large amount of material showed that it may happen with non-absorbable suture material. It has happened more frequently after suture of the abdominal wall layer by layer than through and through. Surgeons in whose cases such a prolapse occurred stated that their suture by layers was carried out in the most careful manner.

In some cases the prolapse occurred through too early removal of the sutures. In a still larger number it occurred several days after their removal or while they were still *in situ*. The question has arisen whether the use of drainage favors prolapse of the viscera, but from Madelung's statistics this is not borne out. Extreme thickness of the abdominal wall, and, on the other hand, very thin walls were described as the cause in several cases.

Postoperative hæmorrhage between the layers of the abdominal wound has only been referred to once as the cause. Infection apparently does not predispose to this condition, as it occurred in a number of cases where the wound healed in a perfectly aseptic manner. Prolapse only rarely occurs after laparotomy for peritoneal tuberculosis, even though fistulæ form. Any sudden increase in the intra-abdominal tension, such as ascites, pregnancy, and tympanites, favor it. In 51 cases a severe cough was

given as the cause of the prolapse. In 21 cases vomiting was blamed for the prolapse. Getting up too early from bed, or leaving the hospital too early; straining at stool, or restlessness have caused it in a number of cases.

The general conditions which have an influence are weakened conditions following myomatous hæmorrhages, fever, syphilis, and carcinoma. Madelung found that postoperative peritonitis was given as the cause in only six cases.

Undoubtedly in every case several factors act together. Many cases show practically no subjective symptoms, such as pain; some patients have their attention first called to the condition on account of feeling wet around the abdominal wall, or because the intestines extended down as far as the thighs. There may be no general disturbance present at all, so that the surgeon's attention is at times not called to the condition until some hours, even days, after it occurs.

The ideal treatment is to replace all of the prolapsed viscera at once; but Madelung believes that the expectant treatment is the best, and that several cases pursued an unfavorable course because the manipulations were too extensive. There are cases where it is impossible to replace the viscera on account of adhesions. Madelung and others have, much to their surprise, seen spontaneous reduction in these cases, with gradual retraction of the viscera inside the abdominal cavity.

Peritonitis has seldom occurred in these cases, either as a result of the prolapse or of the manipulations. Strange to say, of 148 cases, 102 were reported as entirely cured. Such late ill-results as intestinal atony through adhesions or formations of hernia one scarcely notices in the reports. Forty-three patients died. Of these, 29 died as the result of the prolapse.—*Proceedings of the German Surgical Congress, 1905.*

DAVID N. EISENDRATH,
(Chicago.)

REVIEWS OF BOOKS.

FIRST AID IN ILLNESS AND INJURY. By JAMES EVELYN PILCHER, M.D., L.H.D. Ninth Edition. New York: Charles Scribner's Sons, 1905.

Major Pilcher's distinguished services in the United States Army and his editorship of the *Journal of the Association of Military Surgeons* are guarantee enough for the book which lies before us. It is now some thirteen years since the first edition of this work appeared. The rapid exhaustion of edition after edition has made it necessary to get out almost an edition each year. These successive issues have undergone revisions, always keeping the work abreast with the advances of the times. Upon the appearance of the fourth edition, it was found as the text-book on first aid adopted by many of our institutions of learning. The sixth edition, appearing at the close of the Spanish War, introduced the improvements which experience had taught. The present edition shows the work to have attained to the highest degree of perfection in embodying all that represents what is most advanced and practical in first aid in illness and injury.

The author has maintained a clearness of style and freedom from technicality which place the work within the appreciation of the largest number of readers. He has avoided dwelling upon procedures requiring special medical knowledge for their application. The important facts are stated in large and the accessory points in small type; while the author has produced a work of great value for quick reference in emergencies arising before the explorer, the hunter, the dweller in sparsely populated districts, in the household, the factory, and the crowded street, still, the book stands alone in its peculiar value as a military text-book

and guide for the soldier either on the field of battle or on post or detached service.

The first eleven chapters are devoted to human anatomy,—the best simple exposition of anatomy with which we are familiar. Subsequent chapters are upon bacteria, knots and bandages, dressings and applications. Then follow the chapters on accidents and emergencies. Among these are chapters on how to act in the presence of emergency; burns, bruises, and freezing; wounds; bleeding; sprains and dislocations; broken bones; foreign bodies; fainting; fits; smothering; poisons; death; emergencies on the battle-field; carrying the disabled; the care of the human machine, and sanitary suggestions. The book is provided with a good index, contains 208 illustrations, and is well bound in waterproof cloth.

It is because of such works as this that first aid instruction is able to gain such headway in schools and colleges. Practical teaching upon a foundation of anatomy and physiology, instead of the simple presentation of the naked facts, has met with the greatest favor. This book is adapted both as a text-book for students and as a practical book of ready reference for emergency use. We cannot but accord to it our warmest expressions of commendation.

JAMES P. WARBASSE.

ABDOMINAL PAIN: ITS CAUSES AND CLINICAL SIGNIFICANCE. By A. ERNEST MAYLARD, M.B.B.S.(Lond.), Surgeon to the Victoria Infirmary, Glasgow. Philadelphia: P. Blakiston's Son & Co., 1905.

Inspired by the researches of Ross "On the Segmental Distribution of Sensory Disorders," by the paper of MacKenzie on "Some Points bearing on the Association of Sensory Disorders and Visceral Disease," and the very comprehensive treatise of Head "On Disturbances of Sensation with especial Reference to the Pain of Visceral Disease," this volume comes as an afterthought born of the application of these teachings in a large number of cases.

The introductory pages carry us over a familiar ground of the innervation of the abdominal parieties and viscera, concluding with "the correlation between the different parts of the nervous system, the splanchnic and somatic," emphasizing the teachings of Head that the somatic distribution of referred pain is not so much along the course of definite nerves, but that it corresponds to the cutaneous supply of segments of the spinal cord from which the posterior nerve-roots in part arise.

Six chapters are then devoted to a seriatim consideration of pain in affections of the solid and hollow viscera, and four chapters to the more commonly spoken of regional pain,—epigastric, umbilical, anterolateral, hypochondriac, lumbar, iliac and inguinal, dorsal and sacral.

Even with all the detail that the author enters into descriptive of the pain, we fail to recognize any material gain to our knowledge save an indexing of the varied character and distribution of the abdominal pain peculiar to the diseased organs. Where the author is dealing with an analysis of the spontaneous expression of pain, a rather frequent use of pain on pressure which we are wont to speak of as tenderness, is a thing apart. The differentiation of pain is so detailed at times that we hardly believe it practical to apply in the clinical analysis of disease. Here and there a clinical case is narrated with the operation necessitated, to bear out the correctness of the author's diagnosis.

On the whole, the subject-matter so exhaustively treated constitutes rather epicritical remarks of the author's extended and varied experience, and herein lies its real value.

In some concluding chapters the author narrates his methods of preparing the skin for laparotomy, which consists in making an inunction with 20 per cent oleate of mercury preliminary to the usual toilet. The transverse incision of the skin is favored, and in some instances a like division of the rectus muscle. A long rest in bed extending over many weeks is advocated, and when rectal feeding is indicated none other than peptonized milk and saline solution with some opium is countenanced as efficient.

The frankness and simplicity in the narrative of this book afford us a helping hand in unravelling some of the mystery of abdominal pain.

MARTIN W. WARE.

ZUR CHIRURGIE DER URETEREN. By DR. M. ZONDEK. A clinical and anatomical study of 57 pages and 17 illustrations. Published by August Hirschwald, Berlin, 1905.

The demands for more conservative renal surgery have led to the investigation of the causes of surgical diseases of the kidneys. As a result of these investigations, ureteral surgery has arisen; for pathological conditions of the ureters play an important part in the causation and maintenance of surgical diseases of the kidneys.

In this monograph, Zondek has described the anatomical features of the ureters which have a bearing on ureteral surgery, their variations under physiological conditions, and also the pathological changes caused by ureteral abnormalities and diseases.

Zondek deplores the fact that in nearly all modern surgical and anatomical text-books the form of the ureter is either not mentioned or else incorrectly described. This hardly seems excusable, as the natural dilatations and constrictions of the ureter have been correctly described by several of the older writers, and especially because they play such an important part in pathological conditions of the ureter, and hence ureteral surgery.

The transition of the renal pelvis into the ureter may be a gradual process or sharply marked by a constriction, and forms the upper pole of the abdominal dilatation or spindle. The abdominal portion of the ureter (pars abdominalis) is usually dilated, forming a spindle which begins at the origin of the ureter from the pelvis of the kidney, and usually ends in a constriction at the pelvic brim, where the ureter bends over the iliac vessels. The pelvic portion of the ureter (pars pelvina) begins at the pelvic brim and ends at the bladder, where a constriction of the ureter is usually present, giving rise to a pelvic

dilatation or spindle above. Probably the vertical posture of the human body, together with the change in direction, taken by the ureter at the pelvic brim causes the constriction at that point. This constriction is absent in quadrupeds with horizontal bodies and straight ureters, as has been noted by Schwalbe. Zondek states that the form of the human ureter is not acquired after birth, but is an inherited characteristic as it is present in the fœtus. The natural constrictions of the ureter afford places for the location of calculi, which are quite frequently found just above the bladder, but seldom above the constriction at the pelvic brim.

The ureter is an elastic tube, and its length (from 21 to 33 centimetres) varies with the distance between the kidney and the ureteral orifice in the bladder, and so differs in individual cases. In congenitally low kidneys, the ureter may be very short, and, according to Zondek, this interesting condition may be diagnosed by measuring the ureter in the following manner. On inserting a catheter in the ureter the urine is expelled from the catheter at intervals, but as soon as the pelvis of the kidney is reached the flow becomes continuous. The length of the catheter in the ureter when the flow of urine becomes continuous gives the length of the ureter, and if this is much shorter than normal a congenitally low kidney is indicated.

Pathological changes may cause ureteral stenosis, and so interfere with the passage of a catheter by the strictured portion of the ureter. Of special interest is the fact that under physiological conditions ureteral catheterization may be impossible. The opening of the ureter in the bladder may be so small that a catheter cannot be inserted in the ureter, and yet the smallness of the ureteral orifice may not interfere with the passage of urine from the kidney into the bladder. This is likely to be present in complete double ureter where both ureters are usually smaller than the single ureter. Ureteral catheterization may also be prevented by a spasm of the ureteral muscles, and at times by the end of the catheter engaging in the curves of the ureter.

The pathological changes in the ureter and kidney caused by ureteral stricture vary with the degree of stenosis, its situation, and duration. Its effect on the individual is more favorable with a gradually forming stricture than by any sudden interference with the passage of urine from the kidney; as the former better permits the other kidney to readjust itself to the increased work.

Some of the ureteral abnormalities have a very important bearing on kidney and ureteral surgery. A kidney with a double pelvis may permit the resection of half the kidney if it is diseased, and so save the other half if it is healthy. Two ureteral orifices do not always indicate two kidneys. A solitary kidney may be present with complete double ureter. If on cystoscopic examination one ureteral orifice was apparently diseased, and so possibly half the kidney, the removal of the entire kidney would cause the death of the individual. One should bear these abnormalities in mind, especially when the ureteral orifices are atypically placed in the bladder.

The more important operations for the relief of pathological conditions of the ureter are briefly considered.

The illustrations are half-tone reproductions of photographs of anatomical and pathological specimens.

The work is in no sense exhaustive, and its chief value lies in the description of the various anatomical features of the ureters, their physiological variations, their anatomical and pathological conditions; all of which have a bearing on the clinical manifestations of these conditions, and also on ureteral surgery.

JOHN A. SAMPSON.

MANUAL OF GYNÆCOLOGY. By D. BERRY HART, M.D., F.R.C.P.E., F.R.S.E., and A. H. FREELAND BARBOUR, M.A., B.Sc., M.D., F.R.C.P.E., F.R.S.E. With 12 Lithographs and 359 Wood-cuts. 715 pages. Chicago: W. T. Keener & Co.

A book so well known as Hart and Barbour's Gynæcology needs no introduction to the older members of the profession. In the present edition, which is the sixth revision of this valuable

work, the original plan has been followed with seemingly few changes.

The frequent head-lines, the marginal index, and the tables of reference at the beginning of each chapter, make it an admirable work for the student. It is regrettable, however, that this edition has not been brought more up to date, as we note that few of the references are more recent than 1898.

The book is divided into two parts and an appendix. Part I includes the anatomy and physiology of the female pelvic organs and a description of the methods of examination of the female pelvis. The second part of the work is devoted to the consideration of the diseases of the female pelvic organs and their treatment. In the appendix, much of which is new, will be found a chapter on the general technique of abdominal section, with the possible postoperative complications and accidents; electricity in gynæcology; the systematic treatment of nerve prostration; case taking and an index of gynæcological literature.

The chapters on the anatomy and physiology of the pelvic organs are clear, detailed, and well illustrated with cuts from frozen sections, affording a good understanding of the pelvic relations and the actual and relative position of the several pelvic viscera. The chapter on the structural anatomy of the pelvic floor deserves special commendation. While considerable space is given to a description of the various forms of tents and their usage, we would feel that their application is limited in modern gynæcology, and their use as recommended by the authors is not in accord with the customary treatment in this country.

Throughout the book the pathology of each disease receives careful attention, and the symptoms and differential diagnosis, often in tabular form, are presented to the reader with great clearness.

Exception must be taken to the authors' handling of the subjects of pelvic cellulitis, pelvic peritonitis, pelvic hæmatocele, and hæmatoma. While cellulitis and peritonitis are actual patho-

logical conditions, and in certain stages of the processes have a definite symptomatology, they always occur coincident with or as complications of other demonstrable lesions as the primary cause. Hæmatocele and hæmatoma are commonly the results of a ruptured tubal pregnancy, and consequently are not entitled to exhaustive consideration. This chapter, however, gives the reader much valuable information regarding tubal gestation.

The chapters on tubal inflammations and ovarian tumors are particularly well written and worthy of the most careful perusal. The subject of uterine tumors, especially fibromyomata of the uterus, has received attention, the diagnosis and differential diagnosis being treated at some length.

The treatment mentioned and recommended throughout the work is in every way conservative, the typical operations are clearly described, and considerable space is given to the medical treatment of disorders of the female pelvis, a part of the subject too often overlooked because of the surgical tendency of the times.

The book as a whole contains much that is not found in other text-books on the subject, valuable to the practitioner as well as the specialist. It is doubtful if this edition will add anything to the reputation of the authors, as there is not enough that is new in the text to fetch the book up to the standard of the many excellent American works on the subject. The cuts are good, but inferior to those in many of our modern publications. The typography is excellent.

J. O. POLAK.

BAKTERIOLOGISCHE UNTERSUCHUNGEN ÜBER HÄNDE-DESINFECTION und ihre Endergebnisse für die Praxis. Von. Dr. med. O. SARWEY a.o. Professor in Tübingen. Berlin, 1905. Verlag von August Hirschwald. N. W. Unter den Linden 68. Octavo, 90 pages.

As a result of more than 1500 separate tests, continued over the space of four years, the author reaches the following impor-

tant conclusion: "It is impossible to achieve absolute sterility of the hands with any practicable method of hand-disinfection now known; and experiments which tend to prove otherwise are misleading, for all such contain some error in technique which invalidates the result."

The major portion of the book is devoted to the refutation of Ahlfeld's contention that it is possible, at least in a majority of cases, to obtain sterility by his hot-water alcohol method. And the investigations of our author are apparently conclusive as to this point. He admits, however, that by this method the number of bacteria are reduced almost to a minimum, and that it may be impossible to demonstrate bacteria in the skin until the hands have been softened by steaming or caustic soda.

In addition to the main point, as to whether absolute sterility of the hands could be achieved, the investigations were directed to a comparison of the relative values of the various methods employed to diminish the number of bacteria present. Of these, the purely mechanical—marble dust soap—method appeared to be worthless. No appreciable diminution in the number of bacteria present could be noted. Cyllin and sapol solutions were comparatively feeble in their action; lysoform, phenol, and permanganate were somewhat more efficient.

Far greater in their ability to diminish the number of bacteria present are the following, and these increase in efficiency in the order named. Sublimate lanolin, watery solution of mercuric citrate, ethylene diamin, sublamine, sublimate aceton, tr. saponis viridis, hot-water alcohol, sublimate ethyl alcohol and sublimate methyl alcohol. Between the last named there was no appreciable difference noted. But the following group was still more powerful: Bazillol alcohol, lysoform alcohol, chlormethylethyl ether, bleaching powder, and muriatic acid, and 5 per cent. formaldehyde. On account of their irritating properties, the last three are not practicable.

In the choice of a disinfectant, absence of odor, absence of

irritating qualities, comparative harmlessness, and cheapness must be considered as well as efficiency. And considered from all these stand-points, the author believes that either a 2 per cent. lysoform alcohol solution or a 2 per cent. sublamin alcohol solution should have the preference.

In conclusion, the author advocates the use of rubber gloves, as these can be made absolutely sterile, whereas the hands cannot be sterilized. JAMES EDDY BLAKE.

LEITFADEN DER KRIEGS-CHIRURGISCHEN OPERATIONS U. VERBANDSTECHNIK. Von DR. HERMAN FISCHER, Ord. Professor der Chirurgie; Geh. Medizinalrath. Zweite Auflage, mit 55 Abbildungen in Text. Berlin, 1905. Verlag von August Herschwald. N. W. Unter den Linden, 68.

This second edition owes its appearance within four years after the first edition to a desire of the author to have it conform to the field of sanitary ordinances of the War Department, and embody a condensed account of the action of modern projectiles.

The experiences of the late Boer war gleaned from literature have materially contributed to many changes in all the chapters.

The field sanitary division comprises a first-aid station (Truppen Verbandplatz) where the severest emergencies, temporary hæmostasis, tracheotomy in threatened asphyxia, severe pain, syncope, and shock are treated. All major operations, probing of wounds or extraction of any foreign bodies that do not readily present themselves, are interdicted, and all bandaging of wounds is reserved for the second station, the haupt Verbandplatz. This station is equipped with materials for dressing the wounds, apparatus, and the means of transportation, medicines, stimulants, and tents.

This station is subdivided into three sub-stations,—the reception station, where the diagnosis, entry, and distribution of patients are effected; the dressing station, where lesser wounds are

permanently bandaged and severe cases assigned to definite collecting stations, and operating stations, where permanent hæmostasis is performed, primary amputations of great necessity carried out, and tracheotomy, urethrotomy, and extraction of foreign bodies of emergency are executed in tents.

All operations requiring great time and application are referred to the third station, the field (lazareth) hospital, which must be in proximity to the haupt Verbandplatz and in suitable buildings, churches and schools being debarred. No internal diseases are admitted to the field hospital. This is precisely the difficult point.

A fourth station is the Reserve Hospital, which comprises the municipal hospitals of a community or such specially constructed in the community.

For wounds inflicted by the high velocity of the modern rifle, the first-aid package, containing sublimated gauze, is relied upon. For incised wounds due to sabre-cuts, suture and iodoform gauze dressing and drainage are endorsed.

Aside from this special information, the remainder of the book is devoted to a description of specific operations, the methods of which in nowise differ from the description enjoined in the performance of similar operations in civil practice.

MARTIN W. WARE.

MALFORMATIONS OF THE GENITAL ORGANS OF WOMEN. By CH. DEBIENE, Professor of Anatomy in the Medical Faculty at Lille. With 85 illustrations. Translated by J. HENRY C. SIMES, M.D., Emeritus Professor of Genito-Urinary and Venereal Diseases in the Philadelphia Polyclinic. Philadelphia: P. Blakiston's Sons & Co., 1905.

This monograph is a very easily readable and simple narrative of congenital anomalous conditions of the female sexual organs.

The first half of the booklet is descriptive of the anatomy of

the generative organs, inclusive of their embryological development, appropriately illustrated with original drawings after the author's own dissection. The anomalies of the genital tract are viewed not only from an anatomical stand-point, but also the physiological deviations and aberrations of gestation are considered. The information presented is rather a collection of reported cases, and, though epitomized, the faithfulness with which authority for statements is accredited makes the brochure valuable.

MARTIN W. WARE.

TRANSACTIONS OF THE AMERICAN SURGICAL ASSOCIATION. Vol. XXII. Edited by RICHARD H. HARTE, M.D. Philadelphia: William J. Dornan, 1904.

The American Surgical Association has represented the best in American Surgery for a quarter of a century. Founded in 1880 by Gross, it has increased in strength and influence until at the present time it stands among the most important of our scientific bodies. The papers and discussions which are contributed through it to the literature of surgery are largely the products of well directed experience and judicious thought. It has not deviated from its main object, the advancement of surgery; and its work is well in the van of surgical progress. The twenty-three volumes of its Transactions are not only an index to the advancements of the surgery of the world, but are a record of the labors of American surgeons, in which every American physician may take pride, and in which we as citizens may discover in a yet undeveloped country the evidences of well founded scientific organization fostering a spirit which must make for the advancement of one of the most humane and beneficent of the arts.

J. P. WARBASSE.

A TEXT-BOOK OF PHYSIOLOGICAL CHEMISTRY. For Students of Medicine and Physicians. By CHARLES E. SIMON, M.D., of Baltimore. Second Edition, Revised and Enlarged. Octavo, vo, pp. 500. Philadelphia and New York: Lea Brothers & Co., 1904.

Throughout this second edition of Simon's "Physiological Chemistry" there is evidence of careful revision, especially in the chapters dealing with proteids, proteid derivatives, and proteid digestion, concerning which our knowledge is undergoing such rapid development. The work was intended, and is well fitted, to serve both as a text-book and a laboratory guide; the amount, character, and arrangement of its included matter being nicely gauged for course-study, while an appended outline of laboratory work, with numerous references to the text, enables the student to verify in the laboratory many of the statements made in the body of the work, and to familiarize himself with the more important methods of physiological chemistry. This feature of the book is highly commendable, for in the teaching of physiological chemistry, as in that of any other branch of physical science, lecture-room and laboratory work should go hand in hand.

No doubt the author has carefully considered the classification which he gives of protein substances, and that he distinctly prefers the term "albumins" as designating what are commonly called proteids is evident from the fact that he has retained the term in his second edition, while he restricts the term "proteids" to the group of substances commonly designated as compound-proteids. This decision, or choice of terms, the reviewer cannot endorse; for the old term "proteid" is likely to remain with us, for some time at least, as designating the albumins and globulins, both native and derived, while the nuclein-containing and pigment-containing protein substances (which the author classifies as proteids) are really compound proteids, and, for the present, might be designated as proteides. As regards the peptones (which, with the albumoses, fibrin, and the coagulated proteids,

the author classifies as "derived albumins"), it is probable that they are not proteins at all, but substances having very much lower molecular weights and simpler chemical structure; and, inasmuch as they are derived, chiefly by hydrolytic cleavage, from proteids, they may very properly be classified for the present as protein-derivatives, or proteid-cleavage-products.

On the whole, however, the book is an excellent one, being, in the opinion of the reviewer, one of the most useful text-books on the subject in English, and well suited for the use of American medical students. JOHN C. CARDWELL.

THE THYROID AND PARATHYROID GLANDS. By HUBERT RICHARDSON, M.D., Demonstrator of Physiological Chemistry, University of Maryland; late Pathologist to the Mt. Hope Retreat; Pathologist to the Maryland Home for the Feeble-Minded.

"The thyroid gland has proved to be of the greatest importance as a regulator of the general metabolism, interference with its function producing cretinism, infantilism, myxœdema, and Basedow's disease."

These facts have been proven by physiological experiments carried out by many investigators, whose results have been hidden away in the vast mass of literature of the past decade, and are not available to the average physician whose hours are so fully occupied with practical work that he has none to devote to the research necessary to their study. Dr. Richardson has gone carefully through the medical literature of the different languages and brought to light these various experiments, and has recorded them in this volume in addition to his own personal observations and research.

In the chapter treating of the physiology of the gland he has detailed the experiments of Edmunds, Moussu, v. Eiselberg, and others on the removal of the thyroid and parathyroid, and the effect of thyroid feeding, showing the relation of the thyroid and

parathyroid in goitre, cretinism, myxœdema, and Basedow's disease. In the course of these experiments the author's suggestion that "it seems possible that one of the reasons why the human infant is so difficult to raise on artificial food is the absence of the necessary amount of thyroid secretion in the artificial food, as the calf is born with a functionating thyroid, cow's milk probably does not contain the amount of thyroid secretion necessary for the development of the infant," is an observation that deserves careful consideration, and should be borne in mind in the feeding of children with whom artificial foods disagree.

Edmunds's experiments are considered at length and are summarized. These experiments show that the cervical sympathetic is not the main factor in producing protrusion of the eyeball in exophthalmic goitre. This would seem to indicate that the operation on the cervical sympathetic for exophthalmos is not based on good physiological and anatomical reasons; apparently this is true, as the operation has not accomplished the desired results.

In addition to diseases of the thyroid gland itself, the complication of the thyroid in infectious disease is considered. The surgery of the thyroid is presented in very able manner. Especial stress is laid on the importance of leaving part of the thyroid gland and the parathyroids to obviate some of the after complication, especially those of myxœdema and tetanic convulsions. A chapter is devoted to the possibilities of thyroid feeding and the diseases in which it may prove useful.

A few errors have been overlooked, a marked one occurs in the chapter on the anatomy of the glands. The reader will find that the author, in speaking of the branchial arches and clefts, uses the word *bronchial* instead of *branchial.*

Dr. Richardson has in this valuable volume brought the known facts in reference to these glands and their diseases up to date, and put them in a working form for the busy physician that will be greatly appreciated by the profession.

A. R. Allen.

A HAND-BOOK OF SURGERY. By FREDERIC RICHARDSON GRIFFITH, M.D. Philadelphia: W. B. Saunders & Co., 1904.

This work is a compact little volume of less than 600 pages, in which the author has presented a brief outline of the principles and practice of surgery. As is stated in the preface, the book is intended to serve as a working guide for the student and general practitioner. Such a work must of necessity be concise, but in a review of the twenty-five chapters its scope is found to be most comprehensive, and one fails to find any omissions of the essentials of "general surgery" in the broadest sense of the term.

The first few chapters are devoted to equipment, bandaging, anæsthesia, and the principles pertaining to operation in general. Sections are even devoted to microscopical technique and the medico-legal aspect of surgery. Then sections are given to the consideration of wounds, tumors, surgery of the bones and joints, and following these the various regions of the body are taken up in their proper order. The latter chapters are devoted to gynæcology and surgical diseases of the eye and ear.

There are over 400 illustrations, which add much to render more clear the author's descriptions.

WALTER A. SHERWOOD.

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A Monthly Review of Surgical Science and Practice.

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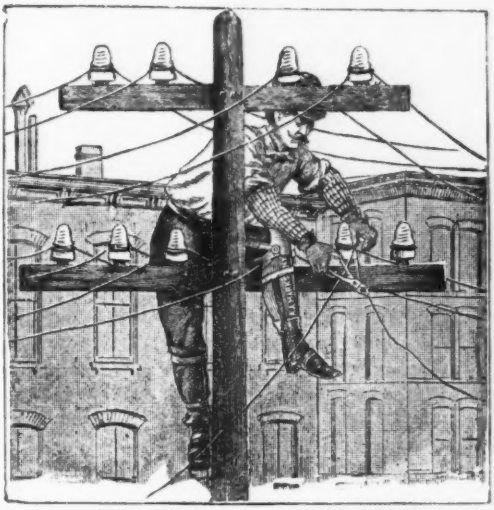

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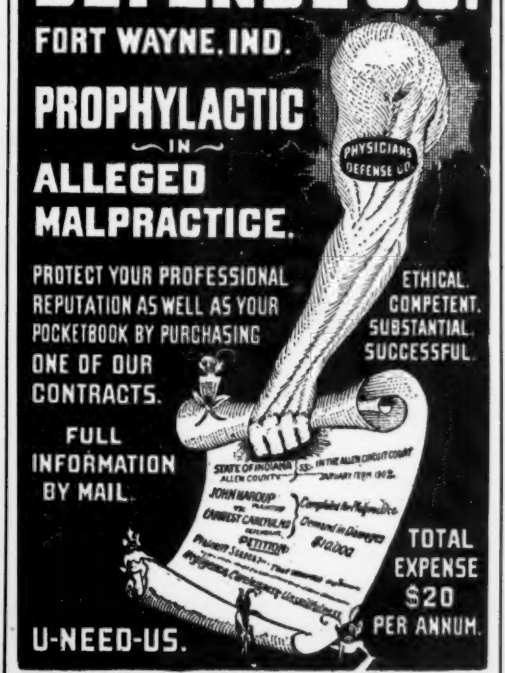

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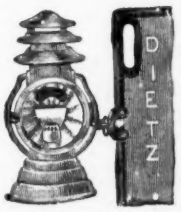

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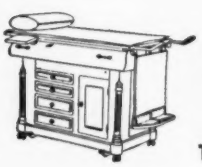

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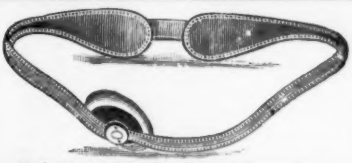
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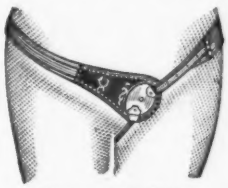

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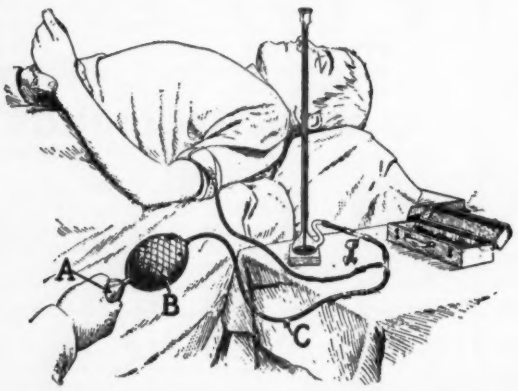

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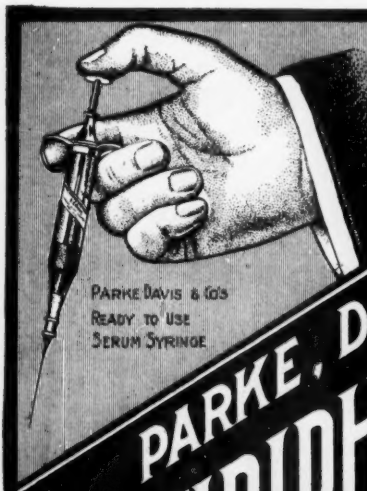

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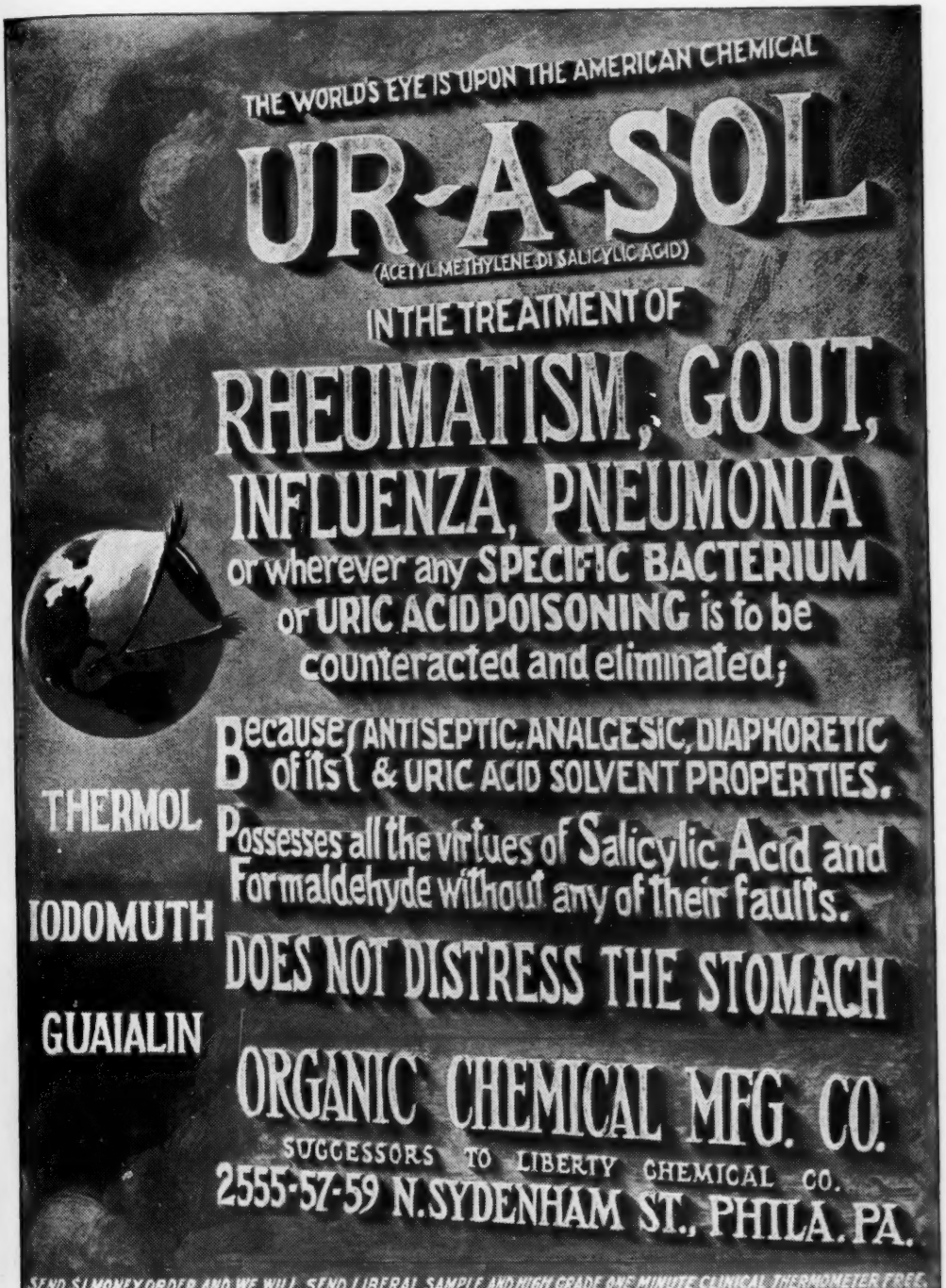
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As far back as 1898, Abba, Director of the Municipal Hygienic Institute of Turin, reported experiments to show that antidiphtheric serum retained its potency unimpaired at least eighteen months after preparation. In 1900 McFarland recorded an essentially similar opinion, extending the period of undiminished potency to two years. Testimony in favor of the remarkable stability of diphtheric antitoxin is elicited to sustain the views of the earlier investigators. Thus Marx, of the Royal Institute of Experimental Therapy in Frankfort, in which the governmental examination for the German Empire is conducted, after an exhaustive study of 1138 lots of antitoxin, publishes his observations in the Festschrift in honor of Robert Koch's sixtieth birthday. He shows conclusively that the majority of serums suffer no antitoxic depreciation even after a lapse of two to five years. The maximum loss of the occasional serum is 33⅓ per cent. and this diminution usually occurs soon after the serum is obtained from the horse. Marx makes this significant statement in concluding his report—"*Any mistrust of old serums is unfounded.*" American serums have been studied by Miller, who tested many samples returned from the market. His results coincide essentially with those obtained by Marx, and he concludes that "*The demand for fresh serum is not justified,*" and urges that no physician should postpone the treatment of a case of diphtheria awaiting fresh serum, simply because the time-limit on that in hand has expired.

With this array of competent scientific authority, and after a series of confirmatory experiments in our biologic laboratories, we have reached the conviction that the arbitrarily-set time-limit of one year can be safely extended. We have accepted the guidance of facts ascertained by exact scientific research which disprove absolute traditions, and which should serve to correct erroneous practices. We bring this testimony to the physician in the conviction that he can without jeopardy to himself or his patient follow its dictates.

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JOSEPH C. HANCE.

Joseph C. Hance died at his country home, Weldon, Montgomery County, Pa., 5.30 A. M., Monday, November 13, 1905, ten days after being stricken by paralysis, from which he never regained full consciousness.

Mr. Hance was a member of the old firm of Hance Brothers & White, Pharmaceutical Chemists, Philadelphia. He joined his brother in the business in early manhood and always commanded the esteem of the correspondents of the house. He was a man fo retiring disposition, whose general condition of health prevented him from taking part in public affairs, although earnestly interested in all that promised for the good of the community.

A man of generous impulses, he endeared himself to those who came to know him intimately.

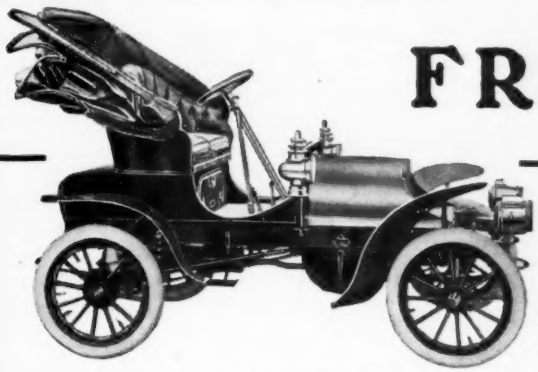
For a number of years he had been a director in the Consolidation National Bank, and was a member of the Art Club, Pennsylvania Historical Society, Franklin Institute, Manufacturers' Club, and Huntingdon Valley Country Club.

He is survived by a widow and one daughter, wife of Professor Blake of Lehigh University.

His funeral took place from his Weldon home.

A SCOTCH DOCTOR'S OPINION

The Quarterly Journal of Inebriety, so well known through its brilliant editor, T. D. Crothers, A.M., M.D., quotes the following statement from one of Great Britain's noted medical men, Dr. John Stewart Norvell, resident surgeon, Royal Infirmary, Edinburgh: "Antikamnia Tablets are a remedy for almost every kind of pain, particularly for headaches, neuralgias, and neuroses due to irregularities of menstruation. They act with wonderful promptness; the dosage is small, two tablets. The undesirable after-effects so commonly attending the use of other coal-tar analgesics are entirely absent, and they can therefore be safely put into the hands of patients for use without the personal supervision of the physician.



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RESPIRATORY AFFECTIONS:
Symptoms and Their Treatment.

By JUSTIN HEROLD, A.M., M.D.,
Former House Physician and Surgeon, St. Vincent's Hospital, New York City; Former Coroner's Physician, City and County of New York; etc. etc.

The past few months have afforded me, and no doubt others, opportunities to test the efficacy of the therapeutic qualities of the various remedies vaunted as certain to relieve the harassing symptoms attendant on the diseases produced by the bacillus of that nineteenth-century infant, "La Grippe."

I refer to this epidemic particularly, because it had not manifested itself in such virulent form since the memorable grippe epidemic of 1889. The author of this paper, in the past few months, has had occasion to employ the several preparations recommended for the relief of the distressing respiratory symptoms attendant upon "la grippe." These manifestations, from my view-point, have been characterized principally by cough and dyspnea, in other words, "dyspneic cough." Expectorant mixtures, anodyne solutions, together with hypodermic medication, produced in me a disgust; and why? Simply and undeniably for the reason that the ordinary cough mixtures contain the opium preparations in such combinations as to leave a depressing effect, which, especially in cases of the grippe of the "depressing or melancholic" type, enhances the already depressed feeling. Combinations of expectorants with timulating ingredients had no less the same effect.

The feelings of the physician are not heightened when his "stand-bys" serve him so poorly; neither are the feelings of the patient calculated to give him increased confidence in his physician. Where lies the fault—in the opium, in the morphine, in the codeine, in the heroin? No, the fault lies in the unstable (or whatever you may call it) combination, or ill-combined ingredients. In seeking for a remedy to relieve the harassing night cough of an attack of "bronchitis due to grippe," in a member of my own family, I chanced to come across a preparation of heroin, which, of all remedies tried, gave relief. I refer to Glyco-heroin (Smith).

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Physicians who desire to prescribe the genuine preparation are therefore urgently requested to write "Syr: Hypophos: Co. Fellows," and to order original bottles whenever possible.

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Mr. Chas. L. Hopkins, District Passenger Agent, Southern Railway, 828 Chestnut Street, Philadelphia, Pa., will take pleasure in furnishing all information.

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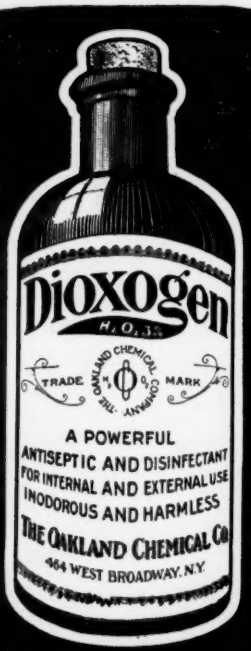

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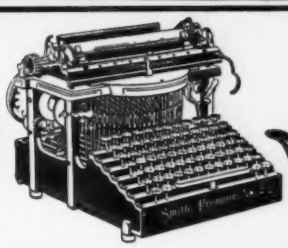

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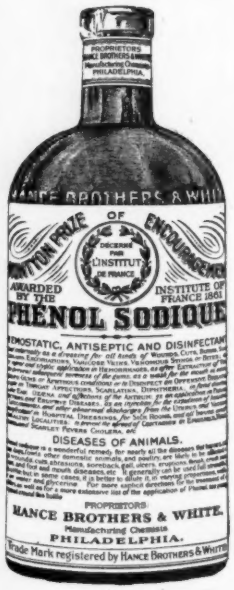

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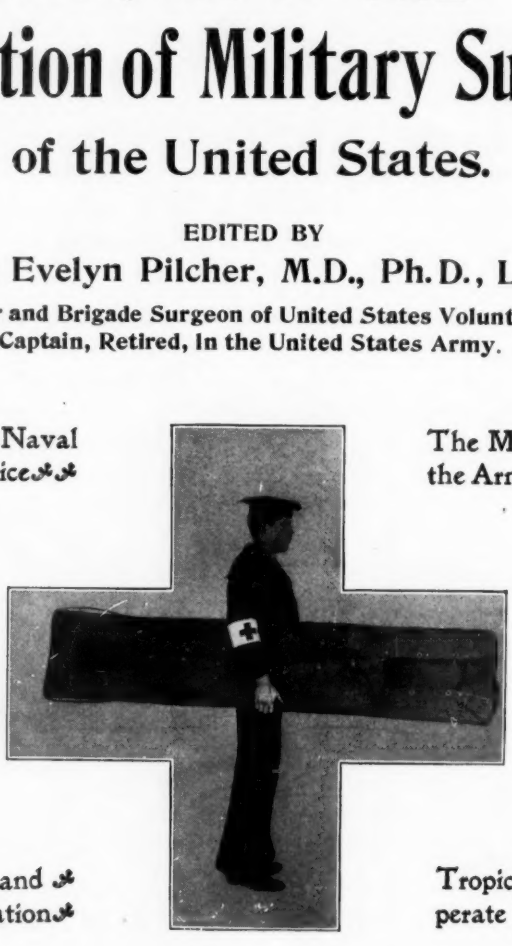

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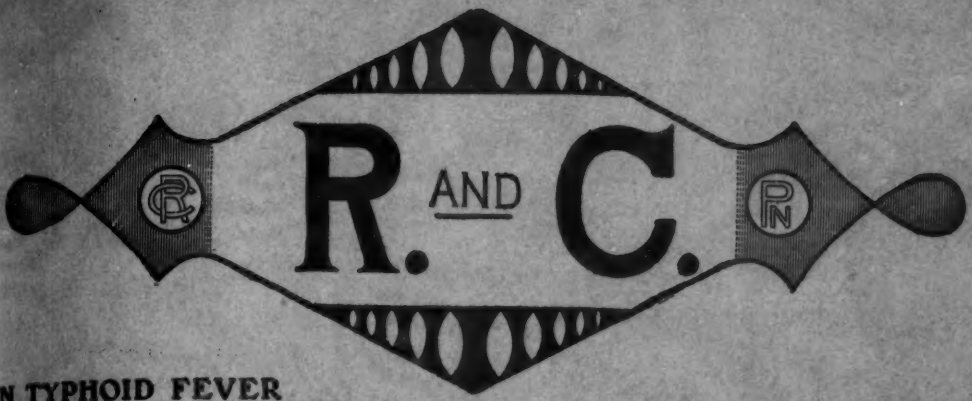

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